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THESIS

INCENTIVE CONTRACTS: TAKING THE GUESS WORK OUT OF SETTING FLEET AVIATION CONSOLIDATED ALLOWANCES (AVCALS)

by

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June 1998

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Over the years in an attempt to create cost savings, the Navy has changed its ways of determining parts allowances. Originally, the Navy used Demand Based Allowancing, in which parts allowances were assigned based upon Original Equipment Manufacturer recommendations, and fleet demand. In the late 1980's, the Navy changed its parts allowancing to Readiness Based Sparing.

During this same time, the parts managers at the Navy Inventory Control Points (ICPs) have received reduced funding for parts support. As a result, parts have been transferred from one deploying unit to the next deploying unit.

This thesis studied the possibility of using incentive contract types in an attempt to ensure the allowances provided to the fleet are accurate and meaningful. Additionally, the use of an incentive-type contract can be used to ensure the parts required to fill the assigned allowances are available to the fleet at Material Support Date (MSD).

This study conducted a comparative analysis of past (post MSD) and present (at MSD) weapon systems to identify costs and benefits associated with the use of incentive-type contracts. Lastly, this study identified a system that has not reached MSD (future) which could possibly benefit from an incentive-type contract.

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requirements for the degree of

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Over the years in an attempt to create cost savings, the Navy has changed its ways of determining parts allowances. Originally, the Navy used Demand Based Allowancing, in which parts allowances were assigned based upon Original Equipment Manufacturer recommendations, and fleet demand. In the late 1980's, the Navy changed its parts allowancing to Readiness Based Sparing.

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I. INTRODUCTION

A. BACKGROUND

Over the years, major weapon systems allowancing procedures and techniques have changed. Initially, spare part allowances were computed through the use of a Demand Based System (DBS). A system which, through the repair and usage of parts, an allowance quantity was determined to fulfill a unit's requirements for a period of time. In the late 1980s, the Center for Naval Analysis (CNA), conducted a study to determine the best mix of parts, given a funding limitation. The study concluded with the invention of an allowancing system known as Readiness Based Sparing (RBS). This algorithmic system, used in conjunction with fiduciary, aircraft mix and Aircraft Intermediate Maintenance Department (AIMD) supportability constraints, predicts the best mix of "low-costing" Sub-Repairable Assemblies (SRAs) needed to maintain a minimum number of "high-costing" Weapon Repairable Assemblies (WRAs).

RBS was developed to help sustain Chief of Naval Operation's (CNO's) aircraft readiness levels and was estimated to save approximately $30 million per Aviation Consolidated Allowance Listing (AVCAL)[1]. Since its inception, allowances associated with major aviation weapon

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[1] Center for Naval Analysis CAB 93-16/September 1993.

systems have been established using RBS. Throughout the years, even the use of RBS has been questioned by senior officials.

This thesis investigates the feasibility of using a combination of data rights and incentive contracting in an attempt to predict accurate and reliable spare parts allowancing. If successful, this strategy has the potential to save money, decrease major weapon systems down time, and increase the reliability of spare parts allowancing.

B. PURPOSE

In today's austere funding, Type Commanders (TYCOMs) have attempted to use funding of backordered initial outfitting spare parts to fund operational commitments.[2] This has resulted in a shortage of available parts required for fully outfitting today's aircraft carrier fleets. Today, in a carrier/air wing work up schedule, the TYCOM is forced to screen and transfer all available parts from non-deployed carriers, to fulfill outstanding spare parts requirements for the deploying carrier and its associated air wing.

This study will review the possibility of using incentive contracts in an attempt to ensure allowances provided to the fleet are accurate and meaningful.

[2] COMNAVSUPSYSCOM message dtd 221430Z May 97 (Subj.: FHP SAVINGS INITIATIVE).

Secondarily, an incentive-type contract can be used to ensure the parts required to fill the assigned allowances are available to the fleet at Material Support Date (MSD).

C. RESEARCH QUESTIONS

1. Primary:

Can the U.S. Navy achieve a realistic AVCAL sufficient to support the fleet, by using a combination of contractor suggested allowances and incentive-type contracts?

2. Secondary:

- How does the U.S. Navy currently calculate initial outfitting allowances?
- How does the U.S. Navy currently fund initial outfitting allowances?
- What is Material Support Date (MSD) and why is it so important?
- How does the incentive-type contract work?
- How will the use of an incentive-type contract differ from how the U.S. Navy currently does business?
- What are the negative effects of using an incentive-type contract for initial outfitting?
- What will be the estimated cost or savings from using an incentive-type contract?

- Does an incentive-type contract provide a "fair and equitable" contract, beneficial to both the Government and commercial suppliers?

D. SCOPE AND METHODOLOGY

The scope of this study will include: (1) an overview of the Navy's Weapon System procurement policy, (2) an overview of the Navy's Weapon System budgetary process, (3) an in-depth review of the Navy's initial outfitting allowance policy, (4) a model study of three separate weapon systems and the applicability of an incentive-type contract, and (5) an interview with commercial suppliers of weapon systems concerning the applicability and acceptability of an incentive-type contract for parts support.

This study will use the following methodology to answer the primary and secondary research questions:

1. Conduct a thorough review of U.S. Navy policies governing the procurement of new weapon systems.

2. Conduct a thorough review of U.S. Navy policies governing the budgetary process of new weapon systems (A key point in determining MSD and fielding equipment to the fleet).

3. Conduct a thorough review of U.S. Navy and Marine Corps policies governing outfitting allowances.

4. Prepare an incentive-type contract which could be used in establishing allowances and parts support to the fleet.

5. Conduct a model study of three weapon systems, comparing current readiness to a proposed readiness using an incentive-type contract.

6. Evaluate the costs and benefits of using incentive-type contracts to assign allowances and provide initial outfitting parts support.

7. Identify potential problems between the Government and commercial suppliers of weapon systems when using an incentive-type contract for parts support.

E. ORGANIZATION

This study is organized in such a way, that the reader receives a full spectrum view of the development of allowancing procedures and current processes used to ensure parts support and availability for deployed U.S. Naval Forces.

The review will start with the establishment of demand based allowancing, proceed through the RBS process and answer the questions of how and why the U.S. Navy changed its allowancing policies. Lastly, with the introduction of an incentive-type contract model, a comparison will be made between cost avoidance and spare parts availability. This

comparison will attempt to prove the incentive-type contracting method can instill confidence in spare parts allowances and eventually take the guess work out of setting fleet AVCAL allowances.

F. CHAPTER REVIEW

This chapter provided background information on how the U.S. Navy has changed its process in determining and developing repair parts allowances in support of aviation units assigned aboard aircraft carriers and naval air stations. A brief description has been given on each of the evolving processes, and how senior officers in the aviation commands have dealt with past repair part shortfalls.

Later chapters of this thesis will provide more detail into each process and their respective advantages and disadvantages. Detailed information on the U.S. Navy's budgeting process will be explained, as this may be a key determinant in the evolving allowancing process.

Finally, this chapter provided the primary and secondary research questions of this thesis and how their eventual answers can be theoretically beneficial to creating an allowancing process that is both economically feasible and reliable. Additionally, the answers to these questions may lead to the development of a model which provides a fair

and equitable deal for all players in the procurement and support system of tomorrow.

II. OVERVIEW OF THE NAVY'S DEMAND BASED ALLOWANCING PROCESS

A. THE NAVY'S BUDGETARY PROCESS

The Navy's budgetary process is but a single piece of the puzzle known as the Federal Budget Process. This process is referred to as the Planning, Programming, and Budgeting System (PPBS). PPBS is the primary resource management process in the Department of Defense (DoD), and is the cornerstone to any purchase that is conducted. PPBS is a cyclical process that is unique to the DoD and was originally introduced by Secretary of Defense Robert McNamara in 1962. It combines the three distinct but interrelated phases of planning, programming and budgeting.

During the planning stage, the Navy must focus on:

- Defining the national military strategy necessary to help maintain national security and support DoD and U.S. foreign policy for the next seven years.
- Planning the integration and balancing of military forces required to accomplish the above strategy.
- Ensuring the proper priorities are assigned to those requirements, in order to manage DoD resources effectively in cases of national resource limitations.

During the programming stage, the Navy develops a list of proposed programs which are required to support the

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During the programming stage, the Navy develops a list of proposed programs which are required to support the

decisions, directions and strategy of the Secretary of Defense. These programs are gathered and compiled as the Navy's Program Objectives Memoranda (POM). The POM translates the results of the DoD planning into a rational, six-year defense program within available resources.

The budgeting stage POMs are reviewed and forwarded by the Office of the Secretary of Defense (OSD), to the Office of Management and Budget (OMB). OMB then reviews all Federal inputs and incorporates requirements into the President's Budget, to be submitted to Congress in February of each year.[3]

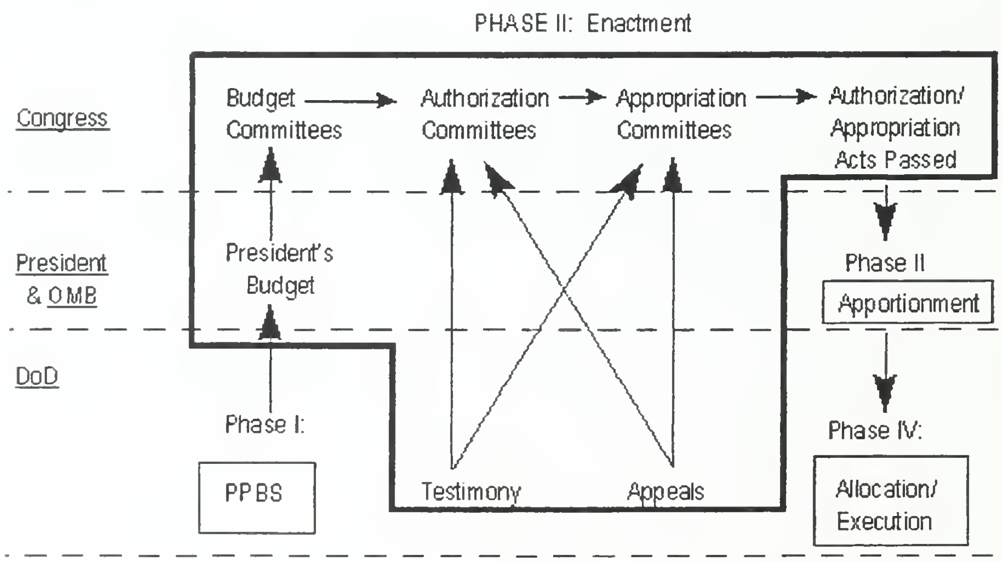

Figure 2-1 PBBS INPUTS AND PHASES
Source: INTRODUCTION TO DEFENSE ACQUISITION MANAGEMENT, THIRD ED. JUNE 1996

[3] Introduction to Defense Acquisition Management; Third Ed. June 1996

As shown in Figure 2-1 above[4], once the President has forwarded his budget to Congress for review, the process of hearings, passing of legislation, apportionment must occur before one penny of Government funding can be obligated and expended. The process that Congress goes through is also a lengthy one. Primarily, Congress must carefully assess whether a change in taxes or a cut in requirements is required in order to fulfill our Nation's requirements, as listed in the President's proposed budget.

As one can see, the act of funding any requirement in the Navy requires careful and thoughtful insight to our future needs. (Figure 2-2)[5] Contracting Officers and

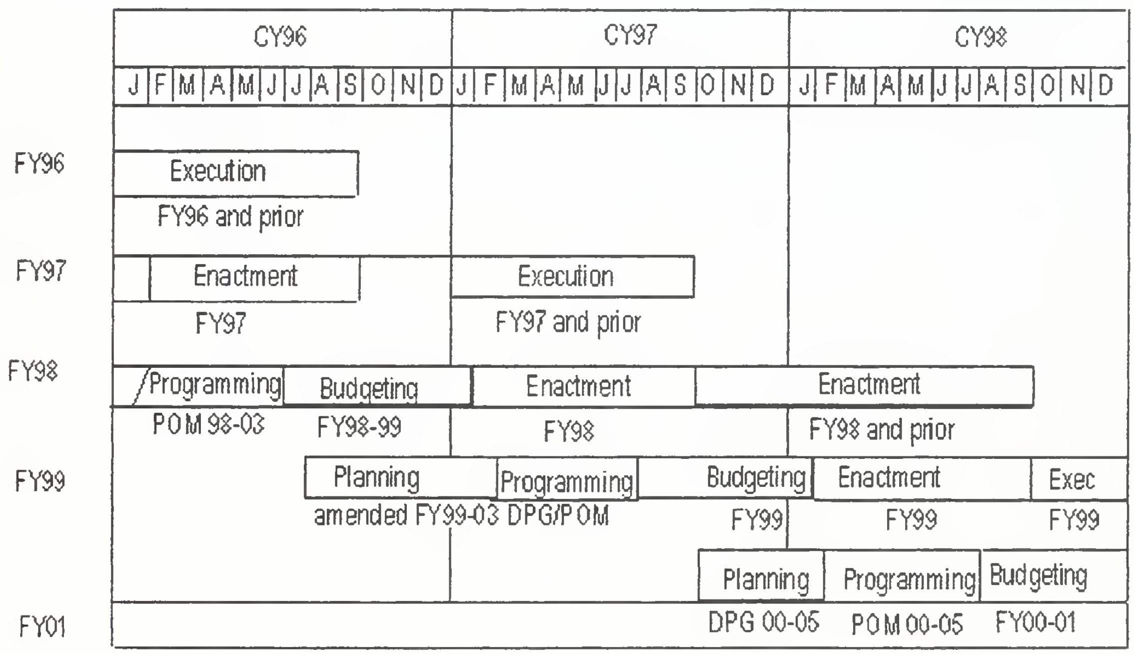

Figure 2-2 PBBS PHASES IN CALENDAR FORMAT
Source: INTRODUCTION TO DEFENSE ACQUISITION MANAGEMENT, THIRD ED. JUNE 1996

[4] Ibid.
[5] Ibid.

Program Managers of weapon systems must look far into the future to determine the fiscal requirements of providing logistics spares for the weapon systems of tomorrow.

B. THE NAVY'S PROCUREMENT POLICY

Another process which requires adequate planning, time and effort, is the Navy's procurement policy for major system acquisitions. The process begins with the generation of requirements based on a continuing policy of assessing the capabilities of the current force structure to meet the projected threat, while taking into account the opportunities for technological advancement, cost savings, and changes in national policy or doctrine.

As shown in Figure 2-3, all of the above factors are incorporated into decisions for the future, and a Mission Need Statement (MNS) for the Navy is generated. The MNS identifies deficiencies in the Navy's posture or the possible opportunity to introduce new capabilities into the Navy's force structure. Once all requirements have been reviewed for similarities, alternatives, and the best concept has been identified, the Navy will generate an Operational Requirements Document (ORD). Eventually, a requirements validation review is conducted to validate and

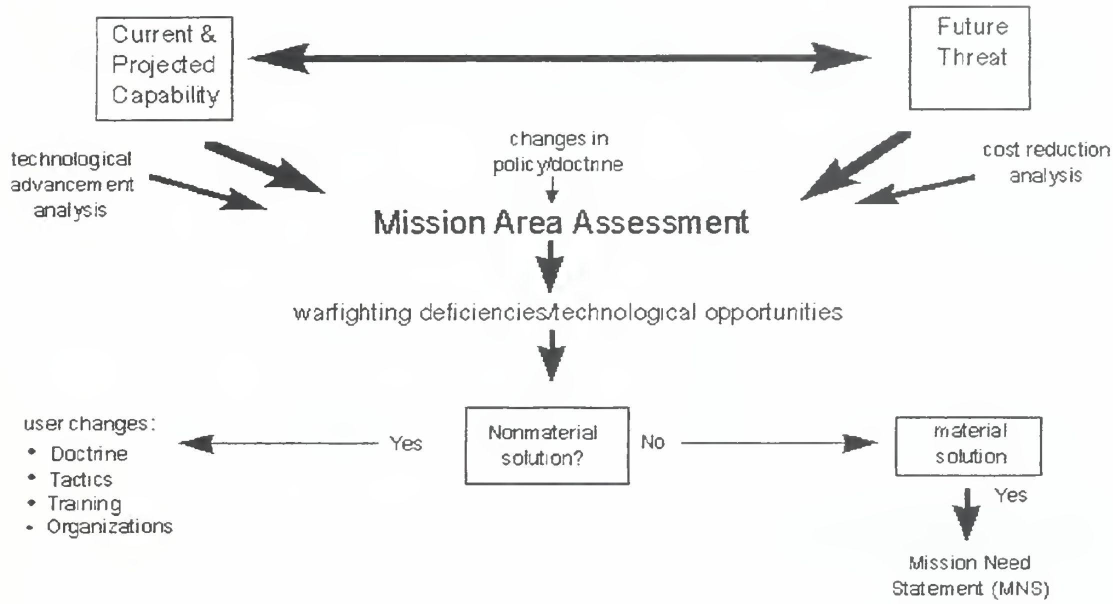

Figure 2-3
INPUTS INTO THE DEVELOPMENT OF A MISSION NEED STATEMENT
Source: INTRODUCTION TO DEFENSE ACQUISITION MANAGEMENT,
THIRD ED. JUNE 1996

approve the MNS. Approval identifies the completion of the validation process and confirms the need for a material solution. At this point, the validating authority will determine the joint possibilities, and then will forward the MNS to the appropriate Milestone Decision Authority (MDA) for Milestone 0 (Concept Exploration) review. The flow of the MNS from the originator to the approval authority is shown in Figure 2-4.

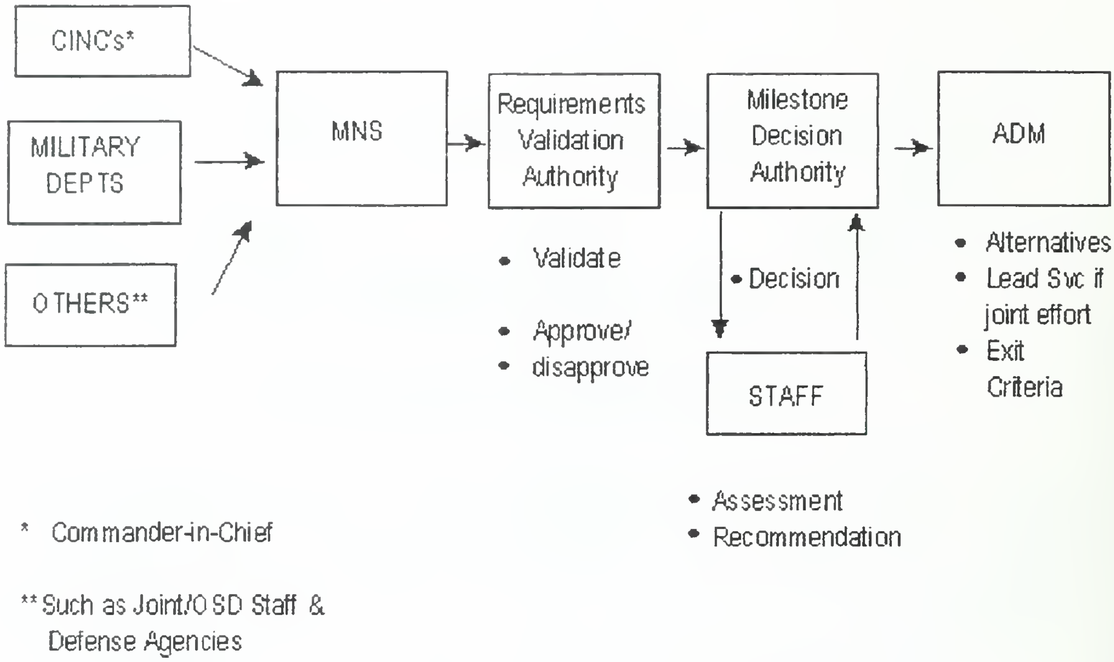

Figure 2-4 FLOW OF MISSION NEED STATEMENT
Source: INTRODUCTION TO DEFENSE ACQUISITION MANAGEMENT, THIRD ED. JUNE 1996

At this point in time, the acquisition of a major weapon system has started its way down the path to concept exploration, and eventually to fielding, as shown in Figure 2-5. However, as stated earlier, this process is one that can take as many as 10 to 20 years. The issue of determining, fielding and procuring logistical spare parts is one which requires foresight, planning and money.

One of the single most important issues concerning spare parts procurement and funding is the way money is allocated and authorized for spending by Congress. Each "pot" of money is assigned to be used for specific purposes. Individuals refer to this as money having "different

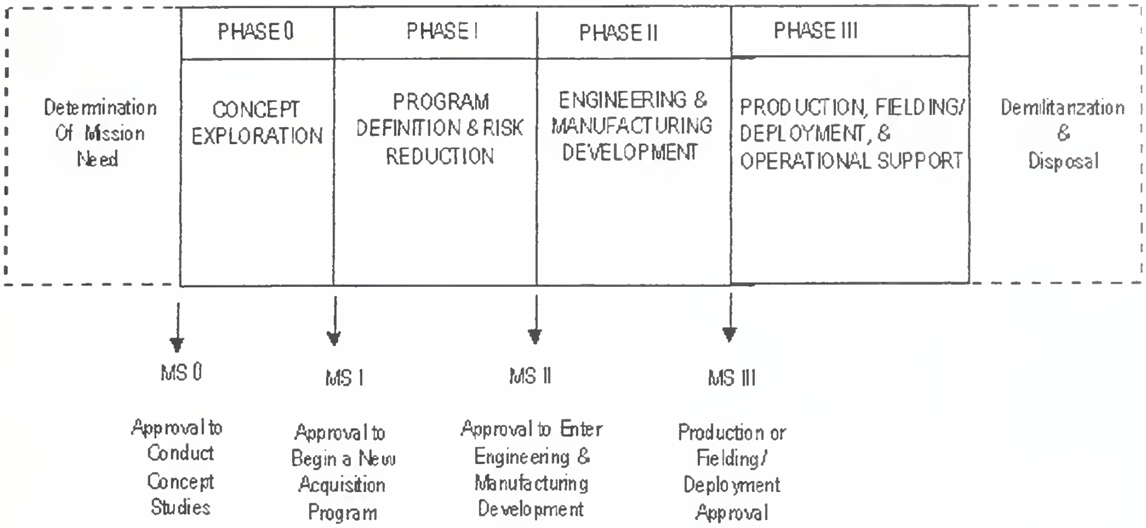

Figure 2-5 PHASES OF A MAJOR WEAPON SYSTEM
Source: INTRODUCTION TO DEFENSE ACQUISITION MANAGEMENT, THIRD ED. JUNE 1996

colors." Because of the unique assignment of "colored money," key events in the milestone process must occur or funding will not be available for spending. For example, in procuring spare parts, the key event is known as the Material Support Date (MSD). At MSD, Navy item managers "take control" of ensuring sufficient parts support to the fleet. This process is done with the use of a different "color" of money, than prior to MSD. Initial outfitting spares are purchased with APN-6 (Aviation Procurement, Navy) dollars, while replenishment spares are purchased with O&MN (Operations and Maintenance, Navy) dollars.

One might ask, "I don't see the impact?" The main concern is that funding is planned for an event, MSD, to take place at a time in the future. Funding is planned with

the proper amount of pre- and post- MSD "colored" funding. If MSD slips, there is no longer sufficient funds to support the slippage, and the post-MSD funding cannot be used, because the MSD event has not taken place. As one can see, although the procurement process is event driven, the PPBS process makes it very difficult to accommodate unforeseen changes, even ones as simple as a slippage in MSD.

C. THE ALLOWANCING PROCESS

The Navy's Demand Based, fixed protection model,(DBS), computes spare parts requirements one component at a time without regard to aircraft readiness or inventory cost. The spares requirements calculated for one part is independent of the requirement calculated for another part. DBS takes into account supply, maintenance, and off-ship resupply functions, using force levels, operating tempo, failure rates, repair capabilities, turn around times, and resupply times. With all of the above variables included in calculating allowances, DBS is a requirements method that selects what is needed to satisfy demand and insure against never having zero ready for issue (RFI) assets when needed[6]. A sample of the DBS, also known as RIMAIR, calculation is shown in Appendix A.[7]

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[6] Center for Naval Analysis briefing CAB 94-75 of January 1995.
[7] NAVICP operations Policy and Procedures Memorandum #231A of 22 Nov 1994.

D. RATIONALE FOR MOVING FROM DEMAND BASED TO READINESS BASED ALLOWANCING

As shown previously, the cost of doing business tomorrow must be planned for in excess of one year in advance. As defense procurement budgets dwindle, logistical support for naval aviation has had to create a better way of supporting the front line fighter with less. As a result of the Defense Management Review Decision (DMRD) 901, the Department of Defense mandated that all Inventory Control Points (ICPs) implement RBS in both outfitting and allowance calculations.[8]

The Center for Naval Analysis (CNA) conducted their first at-sea study of RBS on the *USS AMERICA* in August of 1993. CNA concluded from that study that Chief of Naval Operation's (CNO's) Mission Capable/Fully Mission Capable (MC/FMC) readiness rates as published in the OPNAVINST 5442.4M (see Appendix B), could be attained at a cost savings of $33 million. CNA in their brief of January 1995, describes RBS as a good way for Chief of Naval Operation's staff (OPNAV) budgeters to offset anticipated deficits in outfitting budgets.

In the end, the Navy changed its policy and procedures in outfitting spare parts for two reasons. First, the CAN

[8] NAVICP operations Policy and Procedures Memorandum #231A of 22 Nov 1994

provided evidence that shifting to RBS outfitting could save in excess of $33 million per AVCAL. Second, upon being provided this information, DoD mandated all AVCALs be created using the RBS technique. The bottom line comes down to a possible cure for a lack of funding.

E. CHAPTER REVIEW

This chapter provided a brief overview of the Navy's Demand Based Allowancing Process. It has shown the process of identifying how major weapon systems are presented, reviewed, accepted and approved by the senior leaders of the Department of Defense. It attempted to show how long and drawn out the process of funding approved weapon systems and the support required after they are fielded and the importance of the different "colors" of money. Additionally, this chapter described the DBS process where spare parts allowancing was conducted on a part by part analysis, independent of the allowances of related or supporting parts. Lastly, this chapter briefly described that the U.S. Navy shifted from conducting allowances from DBS to RBS, due to a lack of "expected" funding shortfalls in the future.

The next chapter will discuss RBS allowance analysis, development and associated problem areas, and how RBS can possibly be executed more efficiently.

III. OVERVIEW OF THE NAVY'S READINESS BASED ALLOWANCING PROCESS

A. CHANGES IN THE NAVY'S ALLOWANCE PROCESS

The previous chapters have briefly explained the Planning, Programming, and Budgeting System (PPBS) process and the way the U.S. Navy created and assigned repair parts allowances for Aviation Consolidated Allowance Lists (AVCALs). These chapters have expounded on the long drawn out process of approval for funding future requirements. Additionally, the previous chapters noted that the aviation repair parts allowancing process was somewhat "myopic," in that each part was allowanced independent of supporting subassemblies.

Readiness Based Sparing (RBS) has been proclaimed by the Center for Naval Analysis (CNA) as the best way to offset anticipated deficits in outfitting budgets and assist Chief of Naval Operations staff (OPNAV) budget analysts manage the PBBS process and funds execution.[9] Appendix C shows how the DoD procurement budget has declined over the years; only recently have procurement dollars been increased. However, the Secretary of Defense, John Dalton in his report to Congress, noted the following difficulty in funding investment/modernization accounts:[10]

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[9] CNA Briefing CAB 94-75 of January 1995

[10] Report of the Secretary of Defense found at http://www.dtic.mil/execsec/adr98/chap18.html.

Since 1988, the Department allowed the weapons modernization accounts to decrease while the force was restructured to meet post-Cold War requirements. Additionally, unanticipated contingency and other unplanned operating expenses caused a steady migration of funds from the investment accounts to Operation and Maintenance operating accounts. This lower level of investment initially was appropriate as the force was right-sized by retirement of older equipment and systems. Now, equipment has aged to the point that replacement is needed, but the level of procurement expenditures is inadequate. An increase to at least $54 billion annual procurement in 2000 is needed to achieve the required balance towards a goal of $60 billion in 2001.

Each RBS AVCAL has been proclaimed to provide the same amount of readiness for aviation as with previous Demand Based System (DBS) AVCALs, but at a $34 million cost savings. In comparing RBS and DBS AVCALs, CNA used an Aviation Logistics Model (ALM) to obtain the cost-to-readiness relationship shown in Figure 3-1.[11] CNA describes

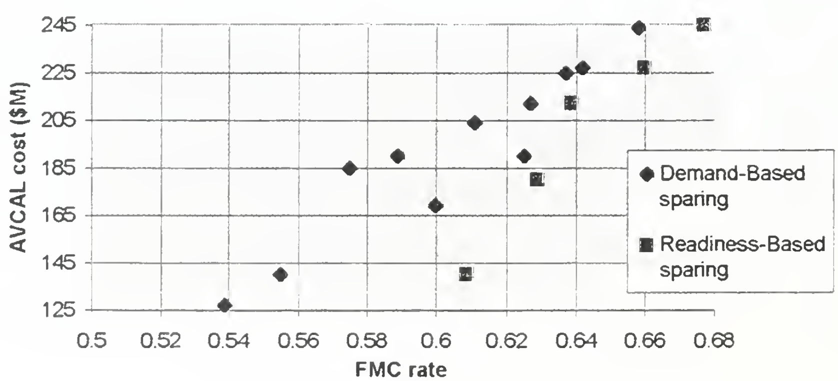

Figure 3-1 ALTERNATIVE AVCALS: READINESS VERSUS COST
Source: CAN BRIEFING CAB 94-75 OF JANUARY 1995

[11] CNA Briefing CAB 94-75 of January 1995

the ALM as a computer simulation that takes into account, day-for-day transactions and computes Fully Mission Capable (FMC) rates and on hand available allowances for a DBS AVCAL, and then compares these projections with the actual numbers reported by RBS AVCAL units.

One might argue that a decrease in actual parts, as a result of funding shortfalls, must create a degradation of readiness. The ability to increase or maintain readiness with less funding, lies in the proper mix of parts included in the AVCAL production. The RBS model assigns allowances based on the infrastructure support of lower assembly repair parts, and the ability of the Air Intermediate Maintenance Department (AIMD) to repair Weapon Repairable Assemblies (WRAs). On the first ever AVCAL, RBS computations allowed the inclusion of 343 more line items than would have been used in a DBS AVCAL. The added components were those low costing Sub Repairable Assemblies (SRAs) needed to correct failures in the high costing WRAs, whose allowances had been decreased (as cost avoidance). Appendix D provides a Sample RBS Calculation.

B. PROBLEMS THAT RBS CREATED

Supply officers and maintenance officers, located both at intermediate and organizational levels, have built over the years a vast level of knowledge on how to support an

embarked airwing. With the advent of RBS, these managers had to not only learn the new RBS model, but had to learn the limits of their people and supported weapon systems.

Supply Departments now had to track the logistics routes for any possible mission the battle group could be assigned. Precious Temporary Additional Duty (TAD) funds had to be expended to place senior enlisted personnel at key points along the logistic routes. The days of submitting a priority replacement requisition into the system and awaiting its arrival was no longer possible. Additionally, "excess" spare parts kept onboard to cover requirements while requisitioned parts are in-transit, were no longer available. RBS had taken those parts off in its cost versus readiness decision table.

Type Commanders and their staff set up matrices to track each and every high priority requisition on a 24 hour basis. Questions such as:

- Is the part available?
- Where is it in the logistics train?
- Why has the part been sitting at the Air Force Terminal for two days?
- Why hasn't the ship received the part? They are in the same port as the part.

- If the part is not available, why aren't we expediting the cannibalization of the part from the Fleet Reserve Air Group (FRAG)?

Questions like these were now asked by admirals in charge of fleet forces. Answers to each of these questions and related questions were provided in person on a daily basis, and via facsimile to the Pentagon at the Chief of Naval Operation's (CNO's) office.

Maintenance Officers now had to ensure that all of the "I" (intermediate) level support equipment was available and useable onboard the deploying carrier. Extensive training of all personnel had to be accomplished, in all fields possible. The RBS AVCAL did not allow for slack. In computing the new allowances, RBS computations took into account the level of manning, the benches which were supposed to be onboard and up and running, and the training requirements that were to be achieved for each carrier. Problems arise from the differences in the paper "should be" numbers used in computing new RBS allowances, and the factual numbers of the equipment, men, training and parts available for a deploying carrier and supporting its embarked airwing.

In the three months prior to deployment of a carrier and its embarked airwing, the TYCOM supply and maintenance staff work continually to achieve the "should be" numbers.

Every step is taken, from expediting stock requisitions in the supply system, to cross decking spare parts from all the "non-deployed" carriers and air stations, to cannibalization of perfectly good aircraft and test benches to ensure the success of the men and women onboard the deployed carrier. In 1995, in excess of 1,700 parts were cross decked from "non-deployed" carriers and air stations to support the carrier getting ready to deploy.[12]

In December of 1994, CNA reported the follow as lessons learned:

> Readiness is achieved from all integrated logistics support (ILS) resources — supply, maintenance, manning, and rear-echelon support. The supply resources are usually the last ones to be calculated using critical data that define all the other ILS resources. There are many ways to balance the ILS equation to achieve the desired level of readiness. Resource allocators choose how this is done. We have shown RBS is a tool resource allocators can use to cut supply costs without reducing readiness or altering other support resources.

What can be perceived from this statement and from factual numbers, are the issues of creating a fictional "clean" and supportive AVCAL, in a realistic environment where 100 percent manning, training and support is not attainable in today's "right-sized" armed forces.

[12] Information presented is based upon the author's experience as the Head of the COMNAVAIRPAC Expediting Division from 1995-1996, and Readiness Officer aboard *USS Kitty Hawk* from April-June 1996.

The CNA studies and Type Commander presentations also show an increase in the number of on-board cannibalizations and Beyond the Capability of Maintenance (BCM) actions.[13]

All of the above problems are real, because of a non-realistic algorithm incorporated to create savings in an era of less procurement dollars (as shown in Appendix C). History has shown that spare parts support becomes more critical to readiness as weapon systems age and defense modernization/investment budgets decline.

C. PROBLEMS ASSOCIATED WITH RBS

As discussed above, the RBS model was perceived to be the answer to the budgeters nightmare of insufficient funds for the future. However, RBS is built on the premise of a "perfect" world, where the supporting infrastructure is available to support a long logistics pipeline and reported data is complete, current, and accurate. It also assumes that if a Fully Mission Capable (FMC) rate is attained, then the matrix measurement of the Mission Capable (MC) rate is attained. This assumption is incorrect. The following example provides proof.

The OPNAVINST 5440.2M (Appendix B), provides an MC/FMC goal for the E-2C of 70/54 percent. Three aircraft are assigned to a carrier for deployment. Assume one aircraft

[13] COMNAVAIRPAC brief of *USS KITTY HAWK's* RBS AVCAL from June-Dec 1994.

is down for a part which has a "long" lead time. Squadron and shipboard maintainers will continually cannibalize this down aircraft, in an attempt to maintain the remaining two aircraft in a fully mission capable status. As a result, the MC/FMC rate will be 66/66. The fully mission capable rate was attained, however the mission capable rate was not. Under the above scenario, which is not uncommon during deployments, it is evident that meeting FMC does not guarantee MC goals will be met.

In a Navy where promotion is built on what you can achieve with less and how much you can save the Department of Defense, one must look hard at the realistic attainability of MC and FMC goals. Squadrons are going to do whatever they have to meet all the missions assigned to them, even if it means missing the MC or FMC goal. CNA admittedly reported that the RBS study accomplished onboard *USS AMERICA*, in 1993-1994 was a success. However;

> …modeling analysis compares a pure RBS inventory with a pure demand-based inventory. By pure, we mean that all the recommended inventory quantities are physically on board the carrier at the beginning of the deployment scenario. We know that this doesn't happen in reality. In fact, when *AMERICA* left Norfolk, 82 percent of the RBS WRAs had an actual on hand quantity equal to the recommended RBS quantity…[14]

[14] CNA study, CRM 94-140 of December 1994.

This study is not attempting to say RBS is wrong. This study is merely pointing out the fact that, in order to make assumptions in creating an RBS AVCAL, one must either take into account our imperfect world of inadequate funding and/or the fact that not all recommended parts are available for supporting the front line war fighters. Making these assumptions up front, have forced the fighting sailor and airman to create problems which were not previously present.

The key variable to the success of our sailors and RBS is the availability of spare parts. The lack of funding to provide spare parts has created a problem of its own. The desire and want of rear-echelon commands to ensure the proper support of their fellow sailors on deployment have lead to a skyrocketing cannibalization rate. In a recent congressional hearing a First Class Petty Officer from Tactical Electronics Warfare Squadron (VAQ) 131 stated, "The lack of spare parts has reached such a low point some young sailors believe that the spare parts are suppose to come from the aircraft instead of the warehouse."[15] However, not only is the young sailor aware of this problem. The Commanding Officer of the same squadron reported,

> …during a six-month deployment…the readiness of his squadron eroded the longer the unit was deployed because of spare parts and equipment problems…The squadron kept flying by trading parts between aircraft.[16]

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[15] Navy Times, *Spare Parts Shortage Hurts Fleet-Working Harder to do Less*, 23 March 1998.
[16] Ibid.

Lastly, the Commanding Officer of the United States Navy's most elite and superior fighter/attack aircraft, Fighter-Attack Squadron (VFA) 113 reported, "…[the squadron is] due to deploy aboard the carrier *Abraham Lincoln* and is expected to deploy on 96-hour notice, but could only do so only by taking equipment from other squadrons."[17]

As noted above, an increased rate of cannibalization of non-deployed aircraft is a direct result of RBS and austere Operation and Maintenance budgets. The next question will be,

"How long can we keep doing this?"

D. CHAPTER REVIEW

This chapter took an in-depth look at how a lack of funding in the area of defense procurement had an impact in the Navy's procedures in calculating aviation spare part allowances. It provided the step-by-step process that is used in creating the RBS model allowances, and how key personnel must chose cost over readiness. Additionally, this chapter presented the many problems that RBS created. Problems such as the new management practices that supply and maintenance officers must incorporate, in an attempt to ensure the safety of our pilots and our Nation, to the high cannibalization rate, which has spread throughout the Navy,

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[17] Ibid.

in a dire attempt to support the fleet. Lastly, this chapter has identified the number one issue in the fleet today, and the number one reason why RBS might fail in the future. The primary reason for the current lack of bench support, higher cannibalization rates, and cross decking of parts is the lack of spare parts required to support the fleet. The lack of spare parts is caused by the inherent lack of planning for sufficient procurement funding for the future, and the constant transfer of funds from the procurement/logistics funds to the operational funding accounts of today.

The next chapter will present the use of an acquisition tool called the incentive contract, and how incentive contracting combined with acquisition reform can be used to possibly improve spare parts support and RBS AVCAL requirements.

IV. INTRODUCTION OF THE INCENTIVE-TYPE CONTRACT

A. HOW DOES THE INCENTIVE-TYPE CONTRACT WORK

In his book *Federal Acquisition and Contract Management*, Hearn discusses the subject of incentive contracting with the following:[18]

> The profit motive is the real essence of incentive contracting. There is an implied assumption by the [G]overnment that a contractor will have more motivation in performing the contract if there is a chance to increase profits. By accepting an incentive contract the contractor is agreeing, at least superficially, with the [G]overnment.
>
> Therefore the objective in an incentive contract is to motivate the contractor or subcontractor to earn more profit. The added earnings will be gained by achieving better performance and controlling costs. Such results are in the best interest[s] of both the prime contractor and the [G]overnment. The technique is to adjust the contractor's profit by comparing the value of the completed contract to the cost and performance goals set in the contract. The profit adjustments may be positive (i.e., reward), negative (i.e. penalty) or a combination of the two.

As one can see, an incentive-type contract is built on the premise of providing a goal for the contractor to attain. One or many goals can be established, but as with any contract between two parties, the goal must be agreed upon by both parties and achievable by the accepting party.

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[18] Hearn, Emmett E. , Federal Acquisition and Contracting Management, pp. 84-85.

The Federal Acquisition Regulation states[19]:

> …required supplies or services can be acquired at lower costs and, in certain instances, with improved delivery or technical performance, by relating the amount of profit or fee payable under the contract to the contractor's performance. Incentive contracts are designed to obtain specific acquisition objectives by—
> (1) Establishing reasonable and attainable targets that are clearly communicated to the contractor; and
> (2) Including appropriate incentive arrangements designed to—
> (i)motivate contractor efforts that might not otherwise be emphasized and
> (ii)discourage contractor inefficiency and waste.

In combining the FAR with Hearn's statement, a conclusion can be made that an incentive-type contract provides a goal or target for the contractor to attain. The target is usually set by the buyer, as a key goal required in attaining the proper outcome. In the instance of logistics support, the possible targets could range from a desired Mean-Time-Between-Failure (MBTF), to the specific number of components produced and delivered within a certain time frame. The contracting officer in today's environment of acquisition reform is at liberty and encouraged to create any number of incentives and targets in an attempt to attain specified goals. The combinations are limitless, and the possible gains to both the contractor and the Government may be in our best interest. In the words of Dr. Kaminski, "Well-structured contracts and well-designed contract

[19] Defense Acquisition Deskbook, FAR 16.4, of December 1997.

incentive[s]…are key in focusing contractor attention on cost reduction."[20]

B. THE BESEN-TERASAWA MODEL AND ITS USE WITH LOGISTICS SUPPORT

At this point in the thesis, I would like to introduce a model study which has been produced and theoretically proven (See Appendix E). The model is called the Bonus Incentive Recruiting Model (BIRM), in which the problem of determining the correct number of recruiting quotas to assign to different regions and personnel is studied. The goals of the bonus incentive recruiting model are as follows:[21]

- Provides an incentive for recruiters to surpass quotas and thereby maximize true market potential.
- Rewards recruiters with monetary bonuses based on their work effort and their ability to forecast.
- Rewards recruiters equitably despite inherent regional market differences in the long run.
- Provides, in the long run, United States Army Recruiting Command (USAREC) headquarters with valuable market information that allows for

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[20] Dr. Paul Kaminski, *Reducing Life Cycle Costs for New and Fielded Systems*, 4 Dec 1995.
[21] Terasawa, Kang, *Quota Based Recruiting System and Bonus Incentive Recruiting Model*, Oct 12, 1996.

efficient future resource reallocation to the productive regions.

- Based on improved forecasting information, the bonus model indirectly reduces staff workload and minimizes the variance in the mission process.
- Model is adjustable to reflect changing Army accession requirements.
- Model is capable of maintaining quality marks.

The Besen-Terasawa study concludes that creating a bonus payment (incentive-type) table[22] provides the benefits to both the recruiting command and the recruiter. The key to the table is the recruiter's self assessed "predicted" requirements (goals). Maximum bonus is assigned if the recruiter attains the exact amount as his self assigned prediction. If the recruiter attains higher than his prediction, the bonus is high, but less than if exactly predicted. Conversely, if the recruiter attains less than predicted, the bonus is low, and even less than if he had over attained his predicted goal.

One can see the similarities between the incentive contract used in acquisition, and the Besen-Terasawa incentive model for recruiting. The key difference between

[22] The "mechanism" incorporated in the incentive table was originally developed by Osband and Reichelstein.

the Besen-Terasawa model and the incentive contract is that the Government sets the targets for goals it wishes the contractor to attain. Granted, however, the contractor must approve of the targets prior to accepting the contract.

This study proposes that in the future we use the incentive contract to conduct future spare parts allowancing. Using a "hybrid type" incentive contract, allowing spare parts contractors to set spare parts allowances based on: (1) their own established targets, and (2) a minimum Government set requirement, just as it is described in the Besen-Terasawa recruiting model. During the Interim Supply Support (ISS) phase (Pre-MSD), the contractor is providing support to a given limited set of fielded equipment. During the ISS phase, the repair parts supply contractor is gathering data on the breakdown of parts, components and repair cycles. By using the Government's required MTBF and usage rates as a minimum setting the contractor can be given the opportunity to provide his "best estimate" of the yearly supply parts support requirements. Given the contractor's prediction and the Government's minimum requirements, an incentive table, just like the one used in the Besen-Terasawa recruiting model can be generated. After a set time of performance, the contractor's actual support numbers can be compared to his "prediction," and incentives can be calculated for

profit or penalty. An example model is provided in Appendix F.

C. BARRIERS TO IMPLEMENTING INCENTIVE-TYPE CONTRACTS

Development and initiation of this type of incentive contract requires ingenuity and creativity. However, as a contracting professional, we must be aware of the fact that ingenuity and incentive contracts can create some of the most complex pieces of paper put into motion. The Federal Acquisition Regulation (FAR) warns us to "…negotiate them [incentive contracts] in full coordination with Government engineering pricing specialists."[23] Additionally, we must be careful to ensure we "…include a cost incentive (or constraint) that operates to preclude rewarding a contractor for superior technical performance or delivery results when the cost of those results outweighs their value to the Government."[24]

Over the years, incentive contracts have received their fair share of Congressional attention. In July of 1988, the Office of the Inspector General (IG) reported to the Secretary of Defense on Incentive contracts. For 1986, the Department of Defense (DoD) had obligated $21.3 billion on 835 fixed-priced-incentive contracts. The issue being investigated was the overpayment, and management control of

[23] FAR part 16.402-2(e), December 1997.
[24] FAR part 16.402-4(b), December 1997.

incentive-type contracts. DoD was responsible for not collecting approximately $940 million in overpayments and accrued interest valued at $18.6 million. This is a prime example of how complex incentive-type contracts combined with a lax attitude to contract administration can present a presumption that incentive-type contracts are bad. Contracting officers must remember a contract is not closed just because the item or service has been provided. The administration and closure of a contract is just as important as assigning a contract.

As noted above, one of the major barriers to assigning an incentive contract, is the Government's past history with effectively monitoring, managing and close out of incentive contracts. The second and largest barrier to assigning an incentive contract for "parts/logistics support" is Title 10, United States Code 2466. Title 10, United States Code 2466 assigns a percentage limitation of not more than 40 percent of the funds available in a fiscal year, be used to contract for depot-level maintenance and repair facilities. (See Appendix G).

Additional barriers to using incentive contracts for "parts and logistics support," are:[25]

[25] JACG Flexible Sustainment Guide, Appendix F, 14 August 1997.

- Contract lengths. In the case where the Service Contracting Act comes into play, contract lengths are limited to five years.
- Competition. While exceptions do exist supporting sole source or other than competitive acquisitions, developing sustained philosophies and contracting methods that dictate sole source contracting, such as this proposed long term incentive contracts, would be counter to current public laws. (i.e., awarding the incentive contract to a new contractor, who has less or higher expectations on the predicted value of the target/goal. In this case, the incentive model would have to be recomputed and a comparison of "best value" to the Government would have to be reviewed.)
- Social Legislation. Since by necessity, contracting methods to support the concepts proposed above would surely dictate sole source contracting to large Original Equipment Manufacturers (OEMs), the Small and Small Disadvantaged Business goals set by Government contracting would be severely impacted.

The last barrier I would like to discuss is the current corporate hierarchy. Senior leaders today are drawn into two different groups, those that advocate logistics support, and those who support force modernization. Today's

political arena is forcing more and more senior DoD executives toward the group favoring modernization. A prime example of this mentality is noted in the Deputy Chief of Naval Operations (Logistics) speech on 5 November 1996, concerning "Balancing Readiness, Resources and Risk." Vice Admiral Hancock is quoted:

> We are spending far too much on logistics relative to our combat forces…especially when you consider our requirements for force modernization. We must transform our current logistics system… First, the Need…as we said, is to generate funds for force modernization…within a constrained defense budget. The Opportunity…is that I believe we can enhance military capability by shifting significant funds from support areas to modernization.

As noted, even the senior leader of logistics for the Navy is suggesting we improve readiness through modernization and process improvement, and not through improved logistics support of what we have. However many within DoD and industry question the wisdom of such an approach, especially in light of reduced defense budgets and increased weapon systems life spans.

D. ACCEPTANCE OF THE "HYBRID" CONTRACT BY INDUSTRY

As mentioned above, the use of incentive contracts is not a new concept. In November of 1987, the General Accounting Office (GAO) reported to the Honorable Senator Levin concerning the targets imposed in Fixed-Price-Incentive-contracts. Although 53.2 percent of the 62

contracts, valued at $997 million overran target price, the GAO stated:

> …mere achievement of target price is no guarantee that the [G]overnment paid an appropriate price under a contract. Target prices are relevant to the question of over or under payment only if they have been properly established to reflect a mutually agreed reasonable price. In theory, this can be achieved only when both the [G]overnment and the contractor are equally knowledgeable and have equal bargaining power in contract negotiations. Without a complete price and cost analysis, including all supporting data available at the time of price negotiations, we know of no way to determine if target prices are reasonably set… Despite these limits, the close clustering of final prices around the targets is an indicator that Fixed[-]Price[-]Incentive contracts are working as they were designed to.

Acceptability by the Government is the first step, however, in order to accomplish the suggested feat, commercial business must also embrace the use of spare parts allowancing through the use of incentive-type contracts. Alan Boyden of Rockwell's Collins Avionics and Communications Division, in discussing the success of the use of an incentive contract using Mean-Time-Between-Failure (MBTF) as its goal, stated the following,[26]

> The benefits of [the incentive contract]…do not end with financial considerations. The pride and satisfaction of having been involved in a paradigm-busting acquisition program from the ground up is apparent in the spirit and "ownership" espoused by both the [G]overnment and contractor program participants. The fact that all program success metrics are being exceeded is evidence that the use of sound business judgment

[26] Contract Management, *AN/ARC-210 Communications Systems Acquisition Reform - A Success Story*, (August 1997), pg. 18.

> is a superb tool for both the [G]overnment and industry

Added benefits to the contractor, include the ability for him to schedule production, because he now has a set amount of assets he must produce throughout the year.

Additionally, with the contractor as the depot repair site or receiving direct information from an organic depot site, the contractor also has the capability to identify if the need for more assets to be manufactured prior to the actual order time. With the incentive profit, payable after a set time frame, preferably after a year or more, the contractor can look forward to the "additional" profit. Lastly, if negotiated properly, the contractor can enter into an incentive contract with revisable goals. In this way, the contractor can continually strive to manufacture "better" parts in an attempt to attain a higher "predicted" goals and follow-on incentive profits.

E. CHAPTER REVIEW

This chapter has introduced the concept of the incentive-type contract and the goals associated with it. It has also introduced the Besen-Terasawa incentive model, a model that allows the Government to incentivize based upon the contractor's predicted goals. This is a major change to the standard Governmental incentive-type contract in which the Government sets the goals for the contractor to attain.

This chapter has also shown that both contractors and Government personnel are amenable to using incentive contracts to attain sufficient parts support in an era of "shrinking" DoD budgets. However, there are major barriers that must be overcome, from "outsourcing" depot repair to the acceptance of allowing contractors to predict and assign spare parts allowances. Lastly, this chapter has shown that incentive-type contracts are not new and are found to be "effective" by the Government (GAO).

Subsequent chapters will be concerned with the gathering of data of three weapon systems, and determining if the use of incentive-type contracts are a viable alternative to the spare parts allowancing process. Finally, a cost and readiness comparison will be conducted to show theoretically, if incentive-type contracts are cost effective in today's austere budget environment.

V. DATA REPRESENTATION

A. COST AND DATA OF WEAPON SYSTEM A (PAST)

The first of three weapon systems to be examined is the Night Targeting System (NTS), for the AH-1W, Cobra helicopter (series "whiskey"). The Interim Supply Support (ISS) phase for this system commenced in 1993, with an expected Material Support Date (MSD) of April 1997. ISS allowances established in 1993 are depicted in Table 5-1.

Old NIIN	Old Cost	New NIIN	Nomenclature	Old Allowance
LL-Z98-M178	$98,000.00	01-430-4088	TSU-MOD	1
LL-Z98-M179	$85,000.00	01-430-9689	PEB	2
LL-Z98-M180	$95,000.00	01-430-3962	PEB	1
LL-Z98-M181	$4,000.00	01-430-3960	SCA MOD	2
LL-Z98-M182	$5,000.00	01-430-9679	LRP	3
LL-Z98-M183	$4,500.00	01-430-9691	LCP	3
LL-Z98-M184	$16,000.00	01-430-3959	CCU	2
LL-Z98-M185	$4,000.00	01-430-3970	LHG	2
LL-Z98-M186	$13,000.00	01-431-6747	CRT MONITOR	1
LL-Z98-M187	$16,000.00	01-431-6742	CCD CAMERA	1
LL-Z98-M188	$35,000.00	01-430-6901	VCR	1
LL-Z98-M189	$140,000.00		TIS (FLIR)	0
LL-Z98-M190	$200,000.00		RFTDL	0
			Total Cost:	$ 503,500

Table 5-1
SNAPSHOT INFORMATION OF THE NIGHT TARGETING SYSTEM COMPONENTS
Source: DEVELOPED BY RESEARCHER

Upon reaching MSD in April 1997, the allowances for the NTS had been adjusted to support all AH-1W helicopters.

However, funding was not available to procure 100 percent of the allowances directed to the fleet. Table 5-2 shows that because of funding shortfalls and re-appropriation of funds, this weapon system had a 42.03 percent monetary shortage of allowances to support the fleet, as of May 1997.[27]

Old NIIN	Old Cost	New NIIN	Old Allowance	New Allowance	Standard Price	Quarterly Demand	Planned Program Requirement	Unfunded Requirement
LL-Z98-M178	$98,000	01-430-4088	1	13	$889,830	29.64	113	48
LL-Z98-M179	$85,000	01-430-9689	2	7	$55,520	9.22	67	28
LL-Z98-M180	$95,000	01-430-3962	1	9	$165,900	11.48	63	27
LL-Z98-M181	$4,000	01-430-3960	2	17	$63,810	32.56	136	58
LL-Z98-M182	$5,000	01-430-9679	3	0	$6,200	0.19	17	6
LL-Z98-M183	$4,500	01-430-9691	3	2	$7,660	0.28	38	11
LL-Z98-M184	$16,000	01-430-3959	2	9	$49,770	0.28	58	25
LL-Z98-M185	$4,000	01-430-3970	2	7	$7,480	0	48	21
LL-Z98-M186	$13,000	01-431-6747	1	12	$15,660	0	97	39
LL-Z98-M187	$16,000	01-431-6742	1	6	$22,120	0	67	27
LL-Z98-M188	$35,000	01-430-6901	1	7	$38,290	12.42	28	21
LL-Z98-M189	$140,000		0	0	$140,000	0		
LL-Z98-M190	$200,000		0	0	$200,000	0		

Table 5-2
THE NIGHT TARGETING SYSTEM NEW PRICES AND ALLOWANCES
Source: DEVELOPED BY RESEARCHER

These tables show that it is not always possible to completely outfit a weapon system, even with proper instructions in place, (e.g., the NAVSUP Instruction 4000.36A), and proper steps in funding for a weapon system (consisting of a mere eleven items). Funding becomes an issue.

[27] Unfunded and PPR allowances gathered through NAVICP snapshot.

Table 5-3, represents the current parts posture of the NTS. It should be noted that deficiencies still exist in a system that has been in use for over two years. Sadly, the percentage of monetary shortfall of allowanced quantities has increased to almost 50 percent. In a military logistics arena where funding is lacking, spare parts support does not appear to be a high priority.

Old NIIN	Old Cost	New NIIN	Old Allowance	New Allowance	Standard Price	Quarterly Demand	Planned Program Requirement	Unfunded Requirement
LL-Z98-M178	$98,000	01-430-4088	1	13	$889,830	19.22	104	52
LL-Z98-M179	$85,000	01-430-9689	2	7	$55,520	2.62	65	34
LL-Z98-M180	$95,000	01-430-3962	1	9	$165,900	6.98	38	14
LL-Z98-M181	$4,000	01-430-3960	2	17	$63,810	12.73	124	66
LL-Z98-M182	$5,000	01-430-9679	3	0	$6,200	0.94	15	10
LL-Z98-M183	$4,500	01-430-9691	3	2	$7,660	0.23	23	13
LL-Z98-M184	$16,000	01-430-3959	2	9	$49,770	0	27	13
LL-Z98-M185	$4,000	01-430-3970	2	7	$7,480	1.50	47	23
LL-Z98-M186	$13,000	01-431-6747	1	12	$15,660	1.33	97	45
LL-Z98-M187	$16,000	01-431-6742	1	6	$22,120	1.33	69	33
LL-Z98-M188	$35,000	01-430-6901	1	7	$38,290	6.32	47	24
LL-Z98-M189	$140,000		0	0	$140,000	0		
LL-Z98-M190	$200,000		0	0	$200,000	0		

Table 5-3
THE NIGHT TARGETING SYSTEM UNFUNDED REQUIREMENTS
Source: DEVELOPED BY RESEARCHER

B. COST AND DATA OF WEAPON SYSTEM B (PRESENT)

The second of three weapon systems to be examined is the Automatic Flight Control System (AFCS) for the H-46, Sea Knight helicopter. The Interim Supply Support (ISS) phase for this system commenced in 1995, with an expected Material

Support Date (MSD) of May 1998. ISS allowances established in October 1995 are depicted in Table 5-4.

NIIN	Old Cost	Nomenclature	Old Allowance
01-421-1216	$2,060.00	CCA	2
01-421-1217	$2,250.00	CCA	2
01-421-1218	$1,430.00	CCA	2
01-421-1220	$2,290.00	CCA	2
01-421-1221	$76,190.00	FLT CONTROL GROUP	8
01-421-1223	$1,320.00	CCA	2
		Total Cost:	$ 628,220

Table 5-4
SNAPSHOT INFORMATION FOR THE AUTOMATIC FLIGHT CONTROL SYSTEM
Source: DEVELOPED BY RESEARCHER

Upon reaching MSD in May 1998, the allowances for the Automatic Flight Control System had been adjusted to support all H-46 helicopters. Again, funding was not available to procure 100 percent of the allowances directed to the fleet. Although allowances had been reduced, Table 5-5 shows the H-46 AFCS has an allowance shortfall of over 75 percent as of the time of this study (May 1998). This shortfall is primarily due to funding constraints and re-appropriation of funds to higher priority programs.[28]

During the Program Objective Memorandum (POM) phase, Chief of Naval Operation's staff (OPNAV) continually plans and provides for only 85 percent of the full funding requirements destined for logistics support. This is done

[28] Unfunded and PPR allowances gathered through NAVICP snapshot.

NIIN	Old Cost	Nomenclature	New Allowance	Old Allowance	Standard Price	Quarterly Demand	Planned Program Requirement	Unfunded Requirement
01-421-1216	$2,060.00	CCA	1	2	$2,060	1.00	25	7
01-421-1217	$2,250.00	CCA	1	2	$2,250	1.00	16	7
01-421-1218	$1,430.00	CCA	1	2	$1,430	1.00	17	7
01-421-1220	$2,290.00	CCA	1	2	$2,290	1.50	17	7
01-421-1221	$76,190.00	FLT CONTROL GROUP	4	8	$76,190	unknown	86	21
01-421-1223	$1,320.00	CCA	1	2	$1,320	1.00	16	7

Table 5-5
AUTOMATIC FLIGHT CONTROL SYSTEMS NEW PRICES, ALLOWANCES AND UNFUNDED REQUIREMENTS
Source: DEVELOPED BY RESEARCHER

to "incentivize" item managers to seek out cost saving initiatives while still attempting to support the fleet. In both of the above weapon systems, the monetary shortfall is greater than the 15 percent shortfall OPNAV initiated during MSD.

Again, these tables indicate that, even with proper instructions and weapon system funding/procedures, support to the fleet of this six component weapon system logistics package is not always possible.

C. ESTIMATED COST AND DATA OF WEAPON SYSTEM C (FUTURE)

The last of the three weapon systems to be examined is the AN/AAQ-14 Precision Strike Forward Looking Infra-Red (FLIR) System for the F-14, Tomcat Fighter aircraft. The Interim Supply Support (ISS) phase for this system commenced in 1997, with an expected Material Support Date (MSD) of May

1999. ISS allowances are depicted below in Table 5-6.

NIIN	Cost	Nomenclature	Current Allowance
01-267-7287	$9,543.12	ELECTRONIC COMPONENT	1
01-268-4611	$59,378.74	SLIP RING	1
01-268-4984	$5,983.98	ELECTRONIC COMPONENT	1
01-268-5008	$1,969.55	CIRCUIT CARD ASSEMBLY	1
01-268-5009	$2,539.50	CIRCUIT CARD ASSEMBLY	1
01-268-5010	$2,523.35	CIRCUIT CARD ASSEMBLY	1
01-268-5733	$16,953.70	RELAY ASSEMBLY, OPTIC	1
01-269-2759	$6,616.17	GYROSCOPE, RATE	1
01-269-9867	$12,471.18	MOTOR, CONTROL	1
01-292-6733	$17,213.74	ROLL ASSEMBLY, OPTIC	1
01-327-1271	$1,598.41	CIRCUIT CARD ASSEMBLY	1
01-327-2548	$2,007.54	CIRCUIT CARD ASSEMBLY	1
01-328-0031	$2,328.89	CIRCUIT CARD ASSEMBLY	1
01-351-0611	$7,438.21	ELECTRONIC COMPONENT	1
01-356-3791	$5,461.74	AMPLIFIER ASSEMBLY	1
01-358-5160	$8,661.68	CIRCUIT CARD ASSEMBLY	1
01-362-6761	$12,067.68	ELECTRONIC COMPONENT	1
01-362-9049	$139,143.51	POWER SUPPLY	1
01-362-9743	$8,980.05	ELECTRONIC COMPONENT	1
01-363-0353	$6,626.51	ELECTRONIC COMPONENT	1
01-363-7072	$92,658.75	AIR CONDITIONER	1
01-363-9488	$26,784.89	SCANNER, MATCHED SET	1
01-364-3118	$73,503.53	DETECTOR ASSEMBLY	1
01-364-9908	$8,319.64	ELECTRONIC COMPONENT	1
01-365-0167	$3,192.88	CIRCUIT CARD ASSEMBLY	1
01-365-6880	$21,972.40	ELECTRONIC UNIT, LASER	1
01-365-9470	$228,746.12	RECEIVER-TRANSMITTER	1
01-366-3099	$21,634.06	ELECTRONIC COMPONENT	1
01-366-3099	$21,634.06	ELECTRONIC COMPONENT	1
01-373-2769	$363,025.29	ROLL SECTION, TARGET	1
01-379-4943	$3,890.94	AMPLIFIER, ELECTRONIC	1
01-380-8079	$12,366.99	ACTUATOR, ELCTRON-ME	1
01-388-2919	$8,993.21	ELECTRONIC COMPONENT	1
01-388-3022	$12,707.05	ELECTRONIC COMPONENT	1
01-388-3777	$13,961.00	NOSE SECTION, TARGET	1
01-388-4059	$13,394.20	ELECTRONIC COMPONENT	1
01-391-4749	$13,992.95	ACTUATOR, ELECTRO-MEC	1
01-398-2147	$3,404.15	AMPLIFIER, ELECTRONIC	1

NIIN	Cost	Nomenclature	Current Allowance
01-415-7720	$13,650.35	PISO CIRCUIT CARD ASSY	1
01-422-7337	$14,520.00	ELECTRONIC COMPONENT	1
01-422-7339	$5,890.00	ELECTRONIC COMPONENT	1
01-426-5090	$9,960.00	GENERATOR, SYMBOL, HE	1
01-426-5091	$5,000.00	INERTIAL SYSTEM NAV	1
01-426-5150	$190,330.00	PANAL, CONTROL, ELECT	1
01-426-5191	$254,110.00	TARGET SET, RADAR	1
01-729-8441	$5,000.00	ELECTRONIC COMPONENT	1
Total Cost:	$1,750,515.65		

Table 5-6
ALLOWANCE LISTING FOR THE PRECISION STRIKE FLIR.
Source: DEVELOPED BY RESEARCHER

Upon reaching MSD in May 1999, the allowances for the Precision Strike FLIR are expected to be adjusted in order to support all F-14 aircraft (approximately 8 Aviation Consolidated Allowance Lists - AVCALs). With procurement funding expected to continue to decline until the year 2000, one could assume this weapon system will have similar allowance shortfalls as the AH-1W NTS and the H-46 AFCS. The past pattern shows a 24 to 50 percent shortage in funding, which equates to a monetary shortfall of $3.3M to $7.0M for this system alone. However, this system is currently showing "unfunded" requirements valued at $28,828,283.77, which equates to a 95 percent shortfall.

The preceding tables of weapon system allowances are but three in a continual list of approximately 500, and procurement funding is still expected to decline over the next several years.

D. INTERVIEW RESULTS

Interviews with item managers and major Department of Defense contracting company personnel revealed that funding shortages are not expected to end anytime in the near future. Personnel interviewed would not comment when spare parts (logistics) support funding shortages are expected to end. However, barring any emergent funding from Congress and OPNAV to make up for the "unofficial" $800 million logistics deficiency that already exists, one can be certain from the budget predictions that it will not be until after the year 2000.

With funding being the number one issue of providing repair parts support to the fleet, a majority of interviewed item managers agree that the United States Navy must look to alternatives to allowancing and outfitting the fleet.

E. CHAPTER REVIEW

This chapter has assembled data for three weapon systems that are in different stages of the outfitting process:

(1) The "past" system is the Night Targeting System, which has gone through the ISS phase, MSD, and has been in use by the fleet for the past year. It is a system which should be fully supported for, however

is only supported at 45 percent of its allowance requirement.

(2) The "current" system is the Automatic Flight Control System, which has gone through the ISS phase, MSD and is new to the fleet. It is a system which is starting its fleet support in a 20 percent monetary/allowance deficient status.

(3) The "future" system is the Precision Strike FLIR, which is currently in its ISS phase, and is not due to reach MSD until May 1999. It too, is also a system "doomed" to reach MSD in an expected monetary/allowance deficient status.

Although previous chapters have introduced and discussed the methodical and step-by-step procedures set out to properly outfit the fleet, the data in this chapter indicate the end results are not even near the desired outcome. In each instance, the weapon system has entered the fleet with insufficient spare parts to support the fielded system.

The next chapter will take a theoretical look at each of these weapon systems and examine the possible advantages of using an incentive contract model for assigning spare parts allowances. Additionally, the study will review how "creating" a more precise AVCAL can lead to the possibility

of accurately predicting future spare parts budgets for the future.

VI. ANALYSIS - MODEL COMPARISONS

A. WEAPON SYSTEM A (PAST)

The "Past" Weapon System examined in the previous chapter was the Night Targeting System (NTS) for the AH-1W, Cobra helicopter. The Allowance listing at Material Support Date (MSD) for the NTS is provided below in Table 6-1.

New NIIN	Pre-MSD Price	Old Allowance	New Allowance	Post-MSD Price	Quarterly Demand	Planned Program Requirement (Aggregate)	Unfunded Requirement
01-430-4088	$98,000	1	13	$889,830	29.64	113	48
01-430-9689	$85,000	2	7	$55,520	9.22	67	28
01-430-3962	$95,000	1	9	$165,900	11.48	63	27
01-430-3960	$4,000	2	17	$63,810	32.56	136	58
01-430-9679	$5,000	3	0	$6,200	0.19	17	6
01-430-9691	$4,500	3	2	$7,660	0.28	38	11
01-430-3959	$16,000	2	9	$49,770	0.28	58	25
01-430-3970	$4,000	2	7	$7,480	0	48	21
01-431-6747	$13,000	1	12	$15,660	0	97	39
01-431-6742	$16,000	1	6	$22,120	0	67	27
01-430-6901	$35,000	1	7	$38,290	12.42	28	21
TOTAL COST	$503,500			$1,322,240			

Table 6-1
THE ALLOWANCE LISTING FOR THE NIGHT TARGETING SYSTEM AT MATERIAL SUPPORT DATE
Source: DEVELOPED BY RESEARCHER

1. RBS MODEL VERSUS INCENTIVE-TYPE CONTRACT MODEL

We will assume an incentive contract is agreed upon by both the contractor and the Government one year prior to Material Support Date (MSD). An additional assumption is that the "negotiated" target price is 10

percent above pre-MSD prices. The 10 percent increase assumes an estimated increase due to inflation and other unrelated factors. This figure can be "negotiated" up or down depending on current economic conditions. Lastly, an assumed profit (target profit) and maximum incentive profit is 7.5 percent of the total price for all of the Planned Program Requirements (PPR) (target price), and a ceiling price will be 120 percent of the target cost. For simplicity, the incentive profit will be weighted for each part based upon price. If the incentive profit is not properly crafted, the contractor can "game" the system by incurring small penalties for high cost parts that do not meet minimum requirements, and by taking large incentives by producing low cost parts which greatly exceed the minimum requirements. However, this hybrid incentive contract prevents this from occurring by using the price of the component as a weighted percentage factor of the total incentive or penalty.

"Negotiated" Target Cost: $27,987,000.[29]

Target Profit: $2,099,025.

Target Price: $30,086,025.

Ceiling Price: $33,584,400.

Maximum Incentive: $2,099,025.

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[29] Negotiated Target Cost is 110 percent of the sum of the products of Pre-MSD Prices and their respective Planned Program Requirement

Share Ratio: 70/30.

For this illustration, the contractor's predicted demand is set 15 percent above the quarterly demand specified in Table 6-1 (As shown in table 6-2).

		PREDICTION										
		Govt. Min	Govt. Min + 5%	Govt Min + 10%	Govt Min +15%	Govt Min +20%	Govt Min +25%	Govt Min +30%	Govt Min +35%	Govt Min +40%	Govt Min +45%	Govt Min +50%
	Govt Min- (Greater than 5%)	-$209,903	-$293,864	-$377,825	-$461,786	-$545,747	-$629,708	-$713,669	-$797,630	-$881,591	-$965,552	-$1,049,513
	Govt Min-5%	-$125,942	-$209,903	-$293,864	-$377,825	-$461,786	-$545,747	-$629,708	-$713,669	-$797,630	-$881,591	-$965,552
	Govt Min-2%	-$41,981	-$125,942	-$209,903	-$293,864	-$377,825	-$461,786	-$545,747	-$629,708	-$713,669	-$797,630	-$881,591
	Govt Min	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
A	Govt Min+5%	$0	$735,407	$693,426	$609,465	$525,504	$441,543	$357,582	$273,621	$189,660	$105,699	$21,738
C	Govt Min+10%	$0	$784,319	$826,300	$784,319	$700,358	$616,397	$532,436	$448,475	$364,514	$280,553	$196,592
T	Govt Min+15%	$0	$802,485	$886,446	$928,427	$886,446	$802,485	$718,524	$634,563	$550,602	$466,641	$382,680
U	Govt Min+20%	$0	$833,274	$917,235	$1,001,196	$1,043,176	$1,001,196	$917,235	$833,274	$749,313	$665,352	$581,391
A	Govt Min +25%	$0	$878,245	$962,206	$1,046,167	$1,130,128	$1,172,108	$1,130,128	$1,046,167	$962,206	$878,245	$794,284
L	Govt Min+30%	$0	$939,151	$1,023,112	$1,107,073	$1,191,034	$1,274,995	$1,316,975	$1,274,995	$1,191,034	$1,107,073	$1,023,112
	Govt Min+35%	$0	$1,017,962	$1,101,923	$1,185,884	$1,269,845	$1,353,806	$1,437,767	$1,479,748	$1,437,767	$1,353,806	$1,269,845
	Govt Min +40%	$0	$1,116,891	$1,200,852	$1,284,813	$1,368,774	$1,452,735	$1,536,696	$1,620,657	$1,662,638	$1,620,657	$1,536,696
	Govt Min+45%	$0	$1,238,425	$1,322,386	$1,406,347	$1,490,308	$1,574,269	$1,658,230	$1,742,191	$1,826,152	$1,868,132	$1,826,152
	Govt Min+50%	$0	$1,385,357	$1,469,318	$1,553,279	$1,637,240	$1,721,201	$1,805,162	$1,889,123	$1,973,084	$2,057,045	$2,099,025

Table 6-2 INCENTIVE TABLE FOR "PAST" SYSTEM
Source: DEVELOPED BY RESEARCHER

After one year of operation in the fleet, the actual quarterly demands are presented in Table 6-3.

Suppose for this unit, the Final Negotiated Price is: $27,500,000.

Profit:

$2,099,025 + [27,987,000 - 27,500,000] * 0.3 = $2,245,125.

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-430-4088	34.87	29.64	19.22	45 %	$1,406,347	0.26	$367,036
01-430-9689	10.85	9.22	2.62	76 %	$1,553,279	0.23	$351,608
01-430-3962	13.51	11.48	6.98	48 %	$1,553,279	0.25	$392,973
01-430-3960	38.31	32.56	12.73	67 %	$1,553,279	0.01	$16,546
01-430-9679	0.22	0.19	0.94	-321 %	($461,786)	0.01	-$6,149
01-430-9691	0.33	0.28	0.23	30 %	$1,107,073	0.01	$13,267
01-430-3959	0.33	0.28	0	165 %	$1,553,279	0.04	$66,185
01-430-3970	0.01	0	1.5	-14900 %	($461,786)	0.01	-$4,919
01-431-6747	0.01	0	1.33	-13200 %	($461,786)	0.03	-$15,987
01-431-6742	0.01	0	1.33	-13200 %	($461,786)	0.04	-$19,677
01-430-6901	14.64	12.42	6.32	57 %	$1,553,279	0.09	$144,780
							$1,305,663

Table 6-3
ACTUAL QUARTERLY DEMANDS FOR THE NIGHT TARGETING SYSTEM
Source: DEVELOPED BY RESEARCHER

Incentive/Penalty (from Table 6-3): $1,305,663.

Price to Government:

$27,500,000 + $2,245,125 + $1,305,663 = $31,050,788.

Contractor's Profit Rate:

$3,550,788 / 27,500,000 = 12.91%

In this example, both the Government and the contractor would have worked together to improve the limited number of high failure components to the fleet. This "teaming" would have incentivized the contractor to attain the "extra" incentive profit.

In the case of the NTS, the actual new prices negotiated by the contractor were 3.5 times greater than the pre-MSD prices. The total funding required to fill all

post-MSD assigned allowances was $131,115,850. Funding at the Chief of Naval Operation's staff (OPNAV) 85 percent level would have equated to $111,448,475. In comparing the above incentive figures with the OPNAV funding, a cost savings of $80,397,687 is evident for this illustrative example.

B. WEAPON SYSTEM B (PRESENT)

The "Present" Weapon System examined in the previous chapter was the Automatic Flight Control System for the H-46 Sea Knight helicopter. The allowance listing for the Automatic Flight Control System is provided below in Table 6-4.

NIIN	Pre-MSD Price	New Allowance	Old Allowance	Post-MSD Price	Quarterly Demand	Planned Program Requirement (Aggregate)	Unfunded Requirement
01-421-1216	$2,060.00	1	2	$2,060	1.00	25	7
01-421-1217	$2,250.00	1	2	$2,250	1.00	16	7
01-421-1218	$1,430.00	1	2	$1,430	1.00	17	7
01-421-1220	$2,290.00	1	2	$2,290	1.50	17	7
01-421-1221	$76,190.00	4	8	$76,190	unknown	86	21
01-421-1223	$1,320.00	1	2	$1,320	1.00	16	7

Table 6-4
ALLOWANCE LISTINGS FOR THE AUTOMATIC FLIGHT CONTROL SYSTEM.
Source: DEVELOPED BY RESEARCHER

1. RBS MODEL VERSUS INCENTIVE-TYPE CONTRACT MODEL

Again we will assume an incentive contract is agreed upon by both the contractor and the Government one year

prior to Material Support Date (MSD). An additional assumption is that the "negotiated" target cost is 10 percent above pre-MSD prices. This percentage is used to assume an expected increase in economy, and other negotiated factors. Lastly, an assumed profit (target profit) and maximum incentive profit is 7.5 percent of the total price for all of the PPR requirements (target price), and a ceiling price will be 120 percent of the target cost. Again for simplicity, the incentive profit will be weighted for each part based upon price. If the incentive profit is not properly crafted, the contractor can "game" the system by incurring small penalties for high cost parts that do not meet minimum requirements, and by taking large incentives by producing low cost parts which greatly exceed the minimum requirements. However, this hybrid incentive contract prevents this from occurring by using the price of the component as a weighted percentage factor of the total incentive or penalty.

"Negotiated" Target Cost: $7,396,620.[30]

Target Profit: $554,746

Target Price: $7,951,366.

Ceiling Price: $8,875,944.

Maximum Incentive: $554,746.

[30] Negotiated Target Cost is 110 percent of the sum of the products of Pre-MSD Prices and their respective Planned Program Requirement

Share Ratio: 70/30.

For this illustration, the contractor's predicted demand is set 15 percent above the quarterly demand specified in Table 6-4 (As shown in Table 6-5).

		PREDICTION										
		Govt. Min	Govt. Min + 5%	Govt Min + 10%	Govt Min +15%	Govt Min +20%	Govt Min +25%	Govt Min +30%	Govt Min +35%	Govt Min +40%	Govt Min +45%	Govt Min +50%
	Govt Min- (Greater than 5%)	-$55,475	-$77,665	-$99,854	-$122,044	-$144,234	-$166,424	-$188,614	-$210,804	-$232,994	-$255,183	-$277,373
	Govt Min- 5%	-$33,285	-$55,475	-$77,665	-$99,854	-$122,044	-$144,234	-$166,424	-$188,614	-$210,804	-$232,994	-$255,183
	Govt Min- 2%	-$11,095	-$33,285	-$55,475	-$77,665	-$99,854	-$122,044	-$144,234	-$166,424	-$188,614	-$210,804	-$232,994
	Govt Min	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
A	Govt Min+5%	$0	$194,359	$183,264	$161,074	$138,884	$116,694	$94,505	$72,315	$50,125	$27,935	$5,745
C	Govt Min+10%	$0	$207,286	$218,381	$207,286	$185,096	$162,906	$140,716	$118,527	$96,337	$74,147	$51,957
T	Govt Min+15%	$0	$212,087	$234,277	$245,372	$234,277	$212,087	$189,897	$167,707	$145,517	$123,328	$101,138
U	Govt Min+20%	$0	$220,224	$242,414	$264,604	$275,699	$264,604	$242,414	$220,224	$198,034	$175,844	$153,654
A	Govt Min +25%	$0	$232,109	$254,299	$276,489	$298,679	$309,774	$298,679	$276,489	$254,299	$232,109	$209,919
L	Govt Min+30%	$0	$248,206	$270,396	$292,586	$314,776	$336,965	$348,060	$336,965	$314,776	$292,586	$270,396
	Govt Min+35%	$0	$269,035	$291,225	$313,415	$335,604	$357,794	$379,984	$391,079	$379,984	$357,794	$335,604
	Govt Min +40%	$0	$295,181	$317,370	$339,560	$361,750	$383,940	$406,130	$428,320	$439,415	$428,320	$406,130
	Govt Min+45%	$0	$327,300	$349,490	$371,680	$393,870	$416,060	$438,250	$460,440	$482,629	$493,724	$482,629
	Govt Min+50%	$0	$366,133	$388,323	$410,512	$432,702	$454,892	$477,082	$499,272	$521,462	$543,652	$554,747

Table 6-5 INCENTIVE TABLE FOR "PRESENT" SYSTEM
Source: DEVELOPED BY RESEARCHER

For this weapon system, we will review two hypothetical situations that can occur after one year. First, the system works as designed and the Mean-Time-Between-Failures (MTBFs)/quarterly demands are exactly as predicted by the contractor.

Pre/Post MSD Price	New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Weight of Incentive	Evaluation Above or Below Govt. Requirement	Incentive from Table	Total Incentive
$2,060	01-421-1216	1.18	1	1	0.02	15.00	$245,372	$5,909
$2,250	01-421-1217	1.18	1	1	0.03	15.00	$245,372	$6,454
$1,430	01-421-1218	1.18	1	1	0.02	15 %	$245,372	$4,102
$2,290	01-421-1220	1.76	1.5	1.5	0.03	15 %	$245,372	$6,569
$76,190	01-421-1221	1.18	1	1	0.89	15 %	$245,372	$218,551
$1,320	01-421-1223	1.18	1	1	0.02	15 %	$245,372	$3,786
								$245,372

Table 6-6
INCENTIVE PROFIT BASED UPON THE CONTRACTOR MEETING PREDICTED VALUES.
Source: DEVELOPED BY RESEARCHER

Suppose for this situation, the Final Negotiated Price is:

$7,500,000.

Profit:

$554,746 + [$7,396,620 - 7,500,000] * 0.3 = $585,760.

Incentive/Penalty (from Table 6-6): $245,372.

Price to Government:

$7,500,000 + $585,760 + $245,372 = $8,331,132.

Contractor's Profit Rate:

$831,132 / $7,500,000 = 11.08%

Under the second scenario, we will assume the contractor had problems with the low costing components and was only able to meet Government minimum requirements. However, for the one high cost component, the contractor was

able to exceed the Government minimum requirements by 25 percent.

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-421-1216	1.18	1	1.18	0 %	$0	0.02	$0
01-421-1217	1.18	1	1.18	0 %	$0	0.03	$0
01-421-1218	1.18	1	1.18	0 %	$0	0.02	$0
01-421-1220	1.76	1.5	1.76	0 %	$0	0.03	$0
01-421-1221	1.18	1	0.88	25 %	$276,489	0.89	$246,267
01-421-1223	1.18	1	1.18	0 %	$0	0.02	$0
							$246,267

Table 6-7
INCENTIVE PROFIT BASED UPON THE CONTRACTOR EXCEEDING ONLY ONE PREDICTION
Source: DEVELOPED BY RESEARCHER

Suppose for this scenario the Final Negotiated Price is: $7,500,000.

Profit:

$554,746 + [$7,396,620 - 7,500,000] * 0.3 = $585,760.

Incentive/Penalty (from Table 6-7): $246,267.

Price to Government:

$7,500,000 + $585,760 + $246,267 = $8,332,027.

Contractor's Profit Rate:

$832,027 / $7,500,000 = 11.09%

In the second scenario, the contractor met Government minimum requirements, which assumes parts were available when the fleet required them. Additionally, one must assume

the contractor had to put in extra hours, time and money to attain such a low MTBF rate on the most expensive component in the weapon system. The profit increase of one-one hundredth of a percent, shows that the contractor cannot "play" the system, by only attaining a low MTBF on one component, while letting all the others fall below his predicted value or below the minimum Government requirements.

In the case of the automatic flight control system, the actual new prices negotiated by the contractor were the same, and the allowances were reduced by a factor of 2. The total funding required to fill all post-MSD assigned allowances was $6,724,200.[31] Funding at the OPNAV 85 percent level would have equated to $5,715,570. In comparing the above incentive figures with the OPNAV funding, a hypothetical cost of an additional $2,616,457 would have to be incurred. However, this price includes the 100 percent availability of parts to assigned allowances. As opposed to the shortages of parts assigned to the assigned allowances for the fleet. The total "unfunded" parts requirement in the fleet for this weapon system is currently $1,665,440.[32] Although not within the scope of

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[31] This value is the sum of the products of the Post-MSD price and its respective Planned Program Requirement.
[32] This value is the sum of the products of the Post-MSD price and its respective Unfunded Requirement.

this thesis, one could ask "What is the price of readiness in this situation?"

C. WEAPON SYSTEM C (FUTURE)

The "Future" Weapon System examined in the previous chapter was the Precision Strike Forward Looking Infra-Red (FLIR) system for the F-14, Tomcat Fighter aircraft. The allowance listing for the Automatic Flight Control System is provided in Table 6-8.

NIIN	Pre-MSD Price	Nomenclature	Current Allowance
01-267-7287	$9,543.12	ELECTRONIC COMPONENT	1
01-268-4611	$59,378.74	SLIP RING	1
01-268-4984	$5,983.98	ELECTRONIC COMPONENT	1
01-268-5008	$1,969.55	CIRCUIT CARD ASSEMBLY	1
01-268-5009	$2,539.50	CIRCUIT CARD ASSEMBLY	1
01-268-5010	$2,523.35	CIRCUIT CARD ASSEMBLY	1
01-268-5733	$16,953.70	RELAY ASSEMBLY, OPTIC	1
01-269-2759	$6,616.17	GYROSCOPE, RATE	1
01-269-9867	$12,471.18	MOTOR, CONTROL	1
01-292-6733	$17,213.74	ROLL ASSEMBLY, OPTIC	1
01-327-1271	$1,598.41	CIRCUIT CARD ASSEMBLY	1
01-327-2548	$2,007.54	CIRCUIT CARD ASSEMBLY	1
01-328-0031	$2,328.89	CIRCUIT CARD ASSEMBLY	1
01-351-0611	$7,438.21	ELECTRONIC COMPONENT	1
01-356-3791	$5,461.74	AMPLIFIER ASSEMBLY	1
01-358-5160	$8,661.68	CIRCUIT CARD ASSEMBLY	1
01-362-6761	$12,067.68	ELECTRONIC COMPONENT	1
01-362-9049	$139,143.51	POWER SUPPLY	1
01-362-9743	$8,980.05	ELECTRONIC COMPONENT	1
01-363-0353	$6,626.51	ELECTRONIC COMPONENT	1
01-363-7072	$92,658.75	AIR CONDITIONER	1
01-363-9488	$26,784.89	SCANNER, MATCHED SET	1
01-364-3118	$73,503.53	DETECTOR ASSEMBLY	1
01-364-9908	$8,319.64	ELECTRONIC COMPONENT	1
01-365-0167	$3,192.88	CIRCUIT CARD ASSEMBLY	1
01-365-6880	$21,972.40	ELECTRONIC UNIT, LASER	1
01-365-9470	$228,746.12	RECEIVER-TRANSMITTER	1
01-366-3099	$21,634.06	ELECTRONIC COMPONENT	1
01-373-2769	$363,025.29	ROLL SECTION, TARGET	1
01-379-4943	$3,890.94	AMPLIFIER, ELECTRONIC	1
01-380-8079	$12,366.99	ACTUATOR, ELCTRON-ME	1
01-388-2919	$8,993.21	ELECTRONIC COMPONENT	1
01-388-3022	$12,707.05	ELECTRONIC COMPONENT	1
01-388-3777	$13,961.00	NOSE SECTION, TARGET	1
01-388-4059	$13,394.20	ELECTRONIC COMPONENT	1
01-391-4749	$13,992.95	ACTUATOR, ELECTRO-MEC	1
01-398-2147	$3,404.15	AMPLIFIER, ELECTRONIC	1
01-415-7720	$13,650.35	PISO CIRCUIT CARD ASSY	1

NIIN	Pre-MSD Price	Nomenclature	Current Allowance
01-422-7337	$14,520.00	ELECTRONIC COMPONENT	1
01-422-7339	$5,890.00	ELECTRONIC COMPONENT	1
01-426-5090	$9,960.00	GENERATOR, SYMBOL, HE	1
01-426-5091	$5,000.00	INERTIAL SYSTEM NAV	1
01-426-5150	$190,330.00	PANAL, CONTROL, ELECT	1
01-426-5191	$254,110.00	TARGET SET, RADAR	1
01-729-8441	$5,000.00	ELECTRONIC COMPONENT	1
Total Cost:	$1,750,515.65		

TABLE 6-8 ALLOWANCES FOR THE PRECISION STRIKE FLIR
Source: DEVELOPED BY RESEARCHER

1. RBS MODEL VERSUS INCENTIVE-TYPE CONTRACT MODEL

In this final weapon system we will again assume an incentive contract is agreed upon by both the contractor and the Government one year prior to Material Support Date (MSD). As in the previous two weapon systems reviewed, we will assume that the "negotiated" target cost is 10 percent above pre-MSD prices. Again, the 10 percent increase in price is to account for inflation and unrelated negotiated changes. An assumed profit (target profit) and maximum incentive profit is 7.5 percent of the total price for all of the PPR requirements (target price), and a ceiling price will be 120 percent of the target cost. Again for simplicity, the incentive profit will be weighted for each part based upon price. This prevents the contractor from taking a small penalty by allowing high cost parts to fail at a high rate, while taking multiple "awards" by keeping low costing parts within or above the predicted values.

"Negotiated" Target Cost: $33,408,636.[33]

Target Profit: $2,505,648.

Target Price: $35,914,284.

Ceiling Price: $40,090,363.

Maximum Incentive: $2,505,648.

Share Ratio: 70/30.

For this illustration, the contractor's predicted demand/mean-time-between-failure (MTBF) is assumed to be set 15 percent above the allowance specified in Table 6-8 (As shown in Table 6-9).

		PREDICTION										
		Govt Min	Govt Min + 5%	Govt Min + 10%	Govt Min +15%	Govt Min +20%	Govt Min +25%	Govt Min +30%	Govt Min +35%	Govt Min +40%	Govt Min +45%	Govt Min +50%
	Govt Min-5%+	-$250,565	-$350,791	-$451,017	-$551,243	-$651,468	-$751,694	-$851,920	-$952,146	-$1,052,372	-$1,152,598	-$1,252,824
	Govt Min-5%	-$150,339	-$250,565	-$350,791	-$451,017	-$551,243	-$651,468	-$751,694	-$851,920	-$952,146	-$1,052,372	-$1,152,598
	Govt Min-2%	-$50,113	-$150,339	-$250,565	-$350,791	-$451,017	-$551,243	-$651,468	-$751,694	-$851,920	-$952,146	-$1,052,372
	Govt Min	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
A	Govt Min+5%	$0	$877,870	$827,757	$727,531	$627,305	$527,079	$426,853	$326,627	$226,401	$126,175	$25,950
C	Govt Min+10%	$0	$936,258	$986,371	$936,258	$836,032	$735,806	$635,580	$535,354	$435,128	$334,902	$234,676
T	Govt Min+15%	$0	$957,943	$1,058,169	$1,108,282	$1,058,169	$957,943	$857,717	$757,491	$657,265	$557,039	$456,813
U	Govt Min+20%	$0	$994,695	$1,094,921	$1,195,147	$1,245,260	$1,195,147	$1,094,921	$994,695	$894,469	$794,244	$694,018
A	Govt Min +25%	$0	$1,048,378	$1,148,604	$1,248,830	$1,349,056	$1,399,169	$1,349,056	$1,248,830	$1,148,604	$1,048,378	$948,152
L	Govt Min+30%	$0	$1,121,083	$1,221,309	$1,321,535	$1,421,761	$1,521,987	$1,572,100	$1,521,987	$1,421,761	$1,321,535	$1,221,309
	Govt Min+35%	$0	$1,215,162	$1,315,388	$1,415,613	$1,515,839	$1,616,065	$1,716,291	$1,766,404	$1,716,291	$1,616,065	$1,515,839
	Govt Min +40%	$0	$1,333,255	$1,433,481	$1,533,707	$1,633,933	$1,734,159	$1,834,385	$1,934,611	$1,984,724	$1,934,611	$1,834,385
	Govt Min+45%	$0	$1,478,332	$1,578,558	$1,678,784	$1,779,010	$1,879,236	$1,979,462	$2,079,688	$2,179,914	$2,230,027	$2,179,914
	Govt Min+50%	$0	$1,653,728	$1,753,954	$1,854,180	$1,954,405	$2,054,631	$2,154,857	$2,255,083	$2,355,309	$2,455,535	$2,505,648

Table 6-9
INCENTVE PROFIT TABLE FOR THE PRECISION STRIKE FLIR.
Source: DEVELOPED BY RESEARCHER

[33] Negotiated Target Cost is 110 percent of the sum of the products of Pre-MSD Prices and their respective Planned Program Requirement.

Since all outcomes for this weapon system are hypothetical, we will look at a good, bad and indifferent scenario outcome to determine the impact on fleet readiness and contractor profit.

For the first scenario, we will assume that the contractor is having difficulty maintaining its predicted MTBFs. We will assume the contractor is able to maintain Government minimum requirements for the high cost items (cost greater than $20,000), but fell short of the Government minimum standards for the low cost items (cost less than or equal to $20,000).

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-267-7287	1.18	1	1.29	-10 %	-551243	0.55%	-$3,005
01-268-4611	1.18	1	1.17	0 %	0	3.39%	$0
01-268-4984	1.18	1	1.29	-10 %	-551243	0.34%	-$1,884
01-268-5008	1.18	1	1.29	-10 %	-551243	0.11%	-$620
01-268-5009	1.18	1	1.29	-10 %	-551243	0.15%	-$800
01-268-5010	1.18	1	1.29	-10 %	-551243	0.14%	-$795
01-268-5733	1.18	1	1.29	-10 %	-551243	0.97%	-$5,339
01-269-2759	1.18	1	1.29	-10 %	-551243	0.38%	-$2,083
01-269-9867	1.18	1	1.29	-10 %	-551243	0.71%	-$3,927
01-292-6733	1.18	1	1.29	-10 %	-551243	0.98%	-$5,421
01-327-1271	1.18	1	1.29	-10 %	-551243	0.09%	-$503
01-327-2548	1.18	1	1.29	-10 %	-551243	0.11%	-$632
01-328-0031	1.18	1	1.29	-10 %	-551243	0.13%	-$733
01-351-0611	1.18	1	1.29	-10 %	-551243	0.42%	-$2,342
01-356-3791	1.18	1	1.29	-10 %	-551243	0.31%	-$1,720
01-358-5160	1.18	1	1.29	-10 %	-551243	0.49%	-$2,728
01-362-6761	1.18	1	1.29	-10 %	-551243	0.69%	-$3,800
01-362-9049	1.18	1	1.17	0 %	0	7.95%	$0
01-362-9743	1.18	1	1.29	-10 %	-551243	0.51%	-$2,828
01-363-0353	1.18	1	1.29	-10 %	-551243	0.38%	-$2,087
01-363-7072	1.18	1	1.17	0 %	0	5.29%	$0
01-363-9488	1.18	1	1.17	0 %	0	1.53%	$0
01-364-3118	1.18	1	1.17	0 %	0	4.20%	$0
01-364-9908	1.18	1	1.29	-10 %	-551243	0.48%	-$2,620
01-365-0167	1.18	1	1.29	-10 %	-551243	0.18%	-$1,005
01-365-6880	1.18	1	1.17	0 %	0	1.26%	$0
01-365-9470	1.18	1	1.17	0 %	0	13.07%	$0
01-366-3099	1.18	1	1.17	0 %	0	1.24%	$0
01-373-2769	1.18	1	1.17	0 %	0	20.74%	$0

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-379-4943	1.18	1	1.29	-10 %	-551243	0.22%	-$1,225
01-380-8079	1.18	1	1.29	-10 %	-551243	0.71%	-$3,894
01-388-2919	1.18	1	1.29	-10 %	-551243	0.51%	-$2,832
01-388-3022	1.18	1	1.29	-10 %	-551243	0.73%	-$4,001
01-388-3777	1.18	1	1.29	-10 %	-551243	0.80%	-$4,396
01-388-4059	1.18	1	1.29	-10 %	-551243	0.77%	-$4,218
01-391-4749	1.18	1	1.29	-10 %	-551243	0.80%	-$4,406
01-398-2147	1.18	1	1.29	-10 %	-551243	0.19%	-$1,072
01-415-7720	1.18	1	1.29	-10 %	-551243	0.78%	-$4,299
01-422-7337	1.18	1	1.29	-10 %	-551243	0.83%	-$4,572
01-422-7339	1.18	1	1.29	-10 %	-551243	0.34%	-$1,855
01-426-5090	1.18	1	1.29	-10 %	-551243	0.57%	-$3,136
01-426-5091	1.18	1	1.29	-10 %	-551243	0.29%	-$1,575
01-426-5150	1.18	1	1.17	0 %	0	10.87%	$0
01-426-5191	1.18	1	1.17	0 %	0	14.52%	$0
01-729-8441	1.18	1	1.29	-10 %	-551243	0.29%	-$1,575
						100.00%	-$87,930

Table 6-10
INCENTIVE PROFIT BASED UPON MEETING MINIMUM GOVERNMENT REQUIREMENTS FOR PARTS COSTING MORE THAN $20,000 AND NOT MEETING MINIMUM REQUIREMENTS FOR PARTS COSTING LESS THAN $20,000
Source: DEVELOPED BY RESEARCHER

Suppose for this scenario, the Final Negotiated Price is:

$35,000,000

Profit:

$2,505,648 + [$33,408,636 - 35,000,000] * 0.3 = $2,028,239.

Incentive/Penalty (from Table 6-10): -$87,930.

Price to Government:

$35,000,000 + $2,028,239 - $87,930 = $36,940,309.

Contractor's Profit Rate:

$1,940,309 / $35,000,000 = 5.54%

Under the second condition, we will assume the contractor had problems with the low costing components and was only able to meet Government minimum requirements.

Additionally, for high costing components the contractor fell short of the Government minimum requirements by 2 percent. However, for the highest costing component, the contractor was able to exceed the Government minimum requirements by 25 percent.

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-267-7287	1.18	1	1.18	0.00	$0	0.55%	$0
01-268-4611	1.18	1	1.20	-2 %	-$350,791	3.39%	-$11,899
01-268-4984	1.18	1	1.18	0.00	$0	0.34%	$0
01-268-5008	1.18	1	1.18	0.00	$0	0.11%	$0
01-268-5009	1.18	1	1.18	0.00	$0	0.15%	$0
01-268-5010	1.18	1	1.18	0.00	$0	0.14%	$0
01-268-5733	1.18	1	1.18	0.00	$0	0.97%	$0
01-269-2759	1.18	1	1.18	0.00	$0	0.38%	$0
01-269-9867	1.18	1	1.18	0.00	$0	0.71%	$0
01-292-6733	1.18	1	1.18	0.00	$0	0.98%	$0
01-327-1271	1.18	1	1.18	0.00	$0	0.09%	$0
01-327-2548	1.18	1	1.18	0.00	$0	0.11%	$0
01-328-0031	1.18	1	1.18	0 %	$0	0.13%	$0
01-351-0611	1.18	1	1.18	0 %	$0	0.42%	$0
01-356-3791	1.18	1	1.18	0 %	$0	0.31%	$0
01-358-5160	1.18	1	1.18	0 %	$0	0.49%	$0
01-362-6761	1.18	1	1.18	0 %	$0	0.69%	$0
01-362-9049	1.18	1	1.20	-2 %	-$350,791	7.95%	-$27,883
01-362-9743	1.18	1	1.18	0 %	$0	0.51%	$0
01-363-0353	1.18	1	1.18	0 %	$0	0.38%	$0
01-363-7072	1.18	1	1.20	-2 %	-$350,791	5.29%	-$18,568
01-363-9488	1.18	1	1.20	-2 %	-$350,791	1.53%	-$5,368
01-364-3118	1.18	1	1.20	-2 %	-$350,791	4.20%	-$14,730
01-364-9908	1.18	1	1.18	0 %	$0	0.48%	$0
01-365-0167	1.18	1	1.18	0 %	$0	0.18%	$0
01-365-6880	1.18	1	1.20	-2 %	-$350,791	1.26%	-$4,403
01-365-9470	1.18	1	1.20	-2 %	-$350,791	13.07%	-$45,839
01-366-3099	1.18	1	1.20	-2 %	-$350,791	1.24%	-$4,335
01-373-2769	1.18	1	0.88	25 %	$1,248,830	20.74%	$258,985
01-379-4943	1.18	1	1.18	0 %	$0	0.22%	$0
01-380-8079	1.18	1	1.18	0 %	$0	0.71%	$0
01-388-2919	1.18	1	1.18	0 %	$0	0.51%	$0
01-388-3022	1.18	1	1.18	0 %	$0	0.73%	$0
01-388-3777	1.18	1	1.18	0 %	$0	0.80%	$0
01-388-4059	1.18	1	1.18	0 %	$0	0.77%	$0
01-391-4749	1.18	1	1.18	0 %	$0	0.80%	$0
01-398-2147	1.18	1	1.18	0 %	$0	0.19%	$0
01-415-7720	1.18	1	1.18	0 %	$0	0.78%	$0
01-422-7337	1.18	1	1.18	0 %	$0	0.83%	$0
01-422-7339	1.18	1	1.18	0 %	$0	0.34%	$0
01-426-5090	1.18	1	1.18	0 %	$0	0.57%	$0
01-426-5091	1.18	1	1.18	0 %	$0	0.29%	$0
01-426-5150	1.18	1	1.20	-2 %	-$350,791	10.87%	-$38,141
01-426-5191	1.18	1	1.20	-2 %	-$350,791	14.52%	-$50,922

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-729-8441	1.18	1	1.18	0 %	$0	0.29%	$0
						100.00%	$36,897

Table 6-11
INCENTIVE PROFIT BASED UPON MEETING MINIMUM GOVERNMENT REQUIREMENTS FOR PARTS COSTING LESS THAN $20,000 AND NOT MEETING MINIMUM REQUIREMENTS FOR PARTS COSTING MORE THAN $20,000
Source: DEVELOPED BY RESEARCHER

Suppose for this scenario the Final Negotiated Price is:

$35,000,000

Profit:

$2,505,648 + [$33,408,636 - 35,000,000] * 0.3 = $2,028,239.

Incentive/Penalty (from Table 6-11): $36,897.

Price to Government:

$35,000,000 + $2,028,239 + $36,897 = $37,065,136.

Contractor's Profit Rate:

$2,065,136 / $35,000,000 = 5.9%

Under the last scenario, we will assume the contractor has some problems with the high costing components, but was able to maintain his predicted allowances (MTBFs). Additionally, for the low cost components, the contractor was able to exceed the Government minimum requirements by 20 percent.

New NIIN	Demand Based Upon Govt. Minimum MTBF	Predicted Quarterly Demand	Actual Quarterly Demand	Evaluation above or below Govt. requirement	Incentive from Table	Weight of Incentive	Total Incentive
01-267-7287	1.18	1	0.94	20 %	$1,248,830	0.55%	$6,808
01-268-4611	1.18	1	1.00	15 %	$1,195,147	3.39%	$40,540
01-268-4984	1.18	1	0.94	20 %	$1,248,830	0.34%	$4,269
01-268-5008	1.18	1	0.94	20 %	$1,248,830	0.11%	$1,405
01-268-5009	1.18	1	0.94	20 %	$1,248,830	0.15%	$1,812
01-268-5010	1.18	1	0.94	20 %	$1,248,830	0.14%	$1,800
01-268-5733	1.18	1	0.94	20 %	$1,248,830	0.97%	$12,095
01-269-2759	1.18	1	0.94	20 %	$1,248,830	0.38%	$4,720
01-269-9867	1.18	1	0.94	20 %	$1,248,830	0.71%	$8,897
01-292-6733	1.18	1	0.94	20 %	$1,248,830	0.98%	$12,280
01-327-1271	1.18	1	0.94	20 %	$1,248,830	0.09%	$1,140
01-327-2548	1.18	1	0.94	20 %	$1,248,830	0.11%	$1,432
01-328-0031	1.18	1	0.94	20 %	$1,248,830	0.13%	$1,661
01-351-0611	1.18	1	0.94	20 %	$1,248,830	0.42%	$5,306
01-356-3791	1.18	1	0.94	20 %	$1,248,830	0.31%	$3,896
01-358-5160	1.18	1	0.94	20 %	$1,248,830	0.49%	$6,179
01-362-6761	1.18	1	0.94	20 %	$1,248,830	0.69%	$8,609
01-362-9049	1.18	1	1.00	15 %	$1,195,147	7.95%	$94,999
01-362-9743	1.18	1	0.94	20 %	$1,248,830	0.51%	$6,406
01-363-0353	1.18	1	0.94	20 %	$1,248,830	0.38%	$4,727
01-363-7072	1.18	1	1.00	15 %	$1,195,147	5.29%	$63,262
01-363-9488	1.18	1	1.00	15 %	$1,195,147	1.53%	$18,287
01-364-3118	1.18	1	1.00	15 %	$1,195,147	4.20%	$50,184
01-364-9908	1.18	1	0.94	20 %	$1,248,830	0.48%	$5,935
01-365-0167	1.18	1	0.94	20 %	$1,248,830	0.18%	$2,278
01-365-6880	1.18	1	1.00	15 %	$1,195,147	1.26%	$15,001
01-365-9470	1.18	1	1.00	15 %	$1,195,147	13.07%	$156,174
01-366-3099	1.18	1	1.00	15 %	$1,195,147	1.24%	$14,770
01-373-2769	1.18	1	1.00	15 %	$1,195,147	20.74%	$247,852
01-379-4943	1.18	1	0.94	20 %	$1,248,830	0.22%	$2,776
01-380-8079	1.18	1	0.94	20 %	$1,248,830	0.71%	$8,823
01-388-2919	1.18	1	0.94	20 %	$1,248,830	0.51%	$6,416
01-388-3022	1.18	1	0.94	20 %	$1,248,830	0.73%	$9,065
01-388-3777	1.18	1	0.94	20 %	$1,248,830	0.80%	$9,960
01-388-4059	1.18	1	0.94	20 %	$1,248,830	0.77%	$9,556
01-391-4749	1.18	1	0.94	20 %	$1,248,830	0.80%	$9,983
01-398-2147	1.18	1	0.94	20 %	$1,248,830	0.19%	$2,429
01-415-7720	1.18	1	0.94	20 %	$1,248,830	0.78%	$9,738
01-422-7337	1.18	1	0.94	20 %	$1,248,830	0.83%	$10,359
01-422-7339	1.18	1	0.94	20 %	$1,248,830	0.34%	$4,202
01-426-5090	1.18	1	0.94	20 %	$1,248,830	0.57%	$7,106
01-426-5091	1.18	1	0.94	20 %	$1,248,830	0.29%	$3,567
01-426-5150	1.18	1	1.00	15 %	$1,195,147	10.87%	$129,946
01-426-5191	1.18	1	1.00	15 %	$1,195,147	14.52%	$173,491
01-729-8441	1.18	1	0.94	20 %	$1,248,830	0.29%	$3,567
						100.00%	$1,203,710

Table 6-12
INCENTIVE PROFIT BASED UPON MEETING THE CONTRACTOR PREDICTED REQUIREMENTS FOR PARTS COSTING MORE THAN $20,000 AND EXCEEDING THE CONTRACTOR PREDICTED REQUIREMENTS FOR PARTS COSTING LESS THAN $20,000
Source: DEVELOPED BY RESEARCHER

Suppose for this scenario the Final Negotiated Price is:

$35,000,000

Profit:

$2,505,648 + [$33,408,636 - 35,000,000] * 0.3 = $2,028,239.

Incentive/Penalty (from Table 6-12): $1,203,710.

Price to Government:

$35,000,000 + $2,028,239 + $1,203,710 = $38,231,949.

Contractor's Profit Rate:

$3,231,949 / $35,000,000 = 9.23%

In the worst case scenario, the contractor and the item manager can work together to maintain parts support at the Government's minimum requirements. Additionally, this pricing arrangement penalizes the contractor for not "standing behind his work," and provides an incentive to improve contractor performance. In the past, the Government's only recourse to this problem was to purchase more spare parts, which in turn provided more profit to the contractor. Past situations in logistics spare parts support did not allow for a "carrot" or "stick" to encourage the contractor to "better" his process, nor "stand behind his work/word."

In the best case scenario, the fleet is provided with the "best" support possible. Additionally, the contractor strives to keep MTBF high or quarterly demand low to achieve the highest profit possible.

In each of the preceding scenarios, the incentive contract ceiling cost is $40,000,000. In comparing this cost with the OPNAV 85 percent budget of $25,815,763.81, this incentive could be assumed to be too expensive. However, one must also take note that this weapon system is considerably under funded at only $1,750,515.65. The researcher believes that the price of $40,000,000 may be reasonable to support the fleet. The question this study presents to today's leadership is; "What price are you willing to pay today to ensure readiness tomorrow?"

D. CHAPTER REVIEW

This chapter has taken the sample incentive-type contract and applied it to three distinctly different weapon systems. Application of this type contract/pricing arrangement has shown mixed results. Use of an incentive-type contract has the potential to produce cost savings, but it does not guarantee all contract requirements will be met. However, in every instance, it has shown that an incentive is provided for the contractor to meet his predicted values. If the contractor can meet or attain his predicted values, the contractor will earn more profit. Conversely, if the contractor is unable to attain his predicted values, the contractor receives less than anticipated profit, no profit, or perhaps a negative profit (loss).

Lastly, as represented in each of the preceding scenarios, the contractor will continually strive to predict the most accurate value for the "best" profit. This in turn provides the Government with a means of precisely calculating appropriate spare parts allowances, and accurate total prices required for budgeting out year requirements. In providing budget personnel with accurate pricing information, the Department of Defense (DoD) will be able to overcome one of its major hurdles in defending its spare parts funding requirements.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This study has presented an overview of the U.S. Navy's complex logistics support, development and acquisition process. Within this system, it is often necessary to anticipate and fund requirements up to six years prior to the formal start of development or procurement. Unlike everyday business accounting processes, the military must also manage and use different "colors" of money (Research and Development, Procurement, Operations and Maintenance appropriations) to develop, procure and support various weapon systems.

Additionally, this study has provided a brief overview of current funding constraints and attendant impacts on logistics support and readiness. Finally, this study introduced and recommended the use of a "hybrid" incentive-type contract to accurately determine supply parts allowances. The proposed hybrid contract incorporates concepts from incentive-type contracts currently in use today and theoretical concepts from the Besen-Teraswa incentive study. This hybrid contract allows the contractor to "predict" the military's supply support requirements. The incentive feature of this proposed contract motivates the contractor to provide "better" products and penalizes

contractors for delivering "inferior" products. This study has also shown that today's military item managers and defense contractors agree that this may be a better way to outfit the military.

B. CONCLUSIONS

1. Conclusion #1

The United States Navy is continually investigating ways to create logistical supply support allowances which both support the fleet and create cost savings. In a time of austere funding, the United States Navy has reviewed its spare parts allowancing process. It has continually looked for "better" ways to calculate allowances and fulfill two requirements. With dwindling procurement accounts, the first requirement is one of cost savings to outfitting appropriations. However, in providing cost savings, the second requirement is to ensure proper logistical support is provided to the fleet. This study has demonstrated how the U.S. Navy has advanced from the Demand Based System (DBS) to the Readiness Based System (RBS) in an attempt to fulfill the above requirements.

2. Conclusion #2

The United States Navy has not demonstrated confidence to "outsource" logistical supply support (Aviation

Consolidated Allowance Lists - AVCAL). Over the years the United States Navy has continued to outsource areas of operations in an attempt to gain cost savings. However, in the area of logistics supply support (spare parts allowancing) the Government is reluctant to trust the contractor. As identified in this study through interviews, item managers still indicate a need for oversight and "control" of logistical parts support. Many personnel interviewed expressed a cautious tone toward outsourcing spare parts allowancing. These same interviewees indicate it will take a great deal of trust to outsource spare parts allowancing.

3. **Conclusion #3**

Under current and historical spare parts policies and procedures, there is little the Government can do to penalize a contractor for providing "bad" work, or to incentivize him to do "better" work. Under normal incentive contracting, the contractor is incentivized to do better and penalized if he does poorly. However, the goals and penalties of the standard incentive contract are based upon Governmental standards. There currently is no set contract which incentivizes the contractor to "tell the truth" in his capabilities, nor for the contractor to provide better logistics support.

4. Conclusion #4

Insufficient funding has adversely affected logistical support and fleet readiness. The very reason this study was conducted was because of a lack of parts. The lack of parts is a direct result of insufficient funding. In each of the scenarios presented in this study, funding was a key issue. Year after year there are shortfalls in the Department of Defense budget. Because logistics support does not provide instantaneous results (i.e. the part may sit on the shelf for some time), it is considered expendable. At some point in the future, the Department of Defense must determine when the cost of logistics support today is worth losing the war of tomorrow.

C. RECOMMENDATIONS

1. Recommendation #1

A pilot study should be conducted by Commander, Naval Air Systems Command (NAVAIR), in conjunction with Commander, Naval Inventory Control Point (NAVICP) and Commander, Naval Sea Systems Command (NAVSEA) to determine the feasibility of using the hybrid incentive contract presented in this study as a means of predicting proper, accurate allowances for the fleet. This would place credence on the Navy's budgetary requirements and dismiss Mr. Zumwalt's (N88CB) main reason comptrollers and budgeters have difficulty in funding

logistics supply spare parts due to its current inaccuracy in predicting its allowances.

2. Recommendation #2

The United States Navy should invest in a study or survey by the Center for Naval Analysis (CNA) to identify two requirements: cost savings and potential partnerships in the use of "hybrid" contracting. Under the first requirement, CNA should attempt to identify if there is a cost savings associated with outsourcing spare parts allowancing to the Original Equipment Manufacturer (OEM) or other defense industrial base entities. Under the second requirement, CNA should identify the interest and desire of defense industrial base companies to "sponsor" a weapon system, or to work hand-in-hand with DoD in using the hybrid contract proposed in this study, to outsource spare parts allowances.

3. Recommendation #3

Current Federal Regulations do not prohibit the use of an incentive contract as described in this study. It is recommended that an incentive-type contract, such as the one mentioned in this study be initiated. The contract type can be incorporated with a supply source, such as with a Prime Vendor contractor. Outcomes of the study should be printed

and distributed to acquisition personnel, to contend or defend the use of the "hybrid" incentive-type contract.

4. Recommendation #4

It is highly recommended that Commander, Naval Supply Systems Command (NAVSUP) review current shortfalls and trends, in an attempt to identify the root cause of growing deficiencies. These trends should then be scrutinized to identify a point in time when logistical support shortfalls bring war fighting resources below Chief of Naval Operation's (CNO's) readiness goals. Only in the past five years, has the Naval War College conducted war games in which logistics support was a determining variable. As discussed in this study, logistics funding has been used to support operational requirements. Only when senior leaders have been shown when and where our forces will be non-operational will appropriate funding for infrastructure and logistical support be provided.

D. ANSWERS TO RESEARCH QUESTIONS

This section will discuss the primary and subsidiary research questions posed for this study in Chapter 1. Although this study did not conclude that incentive contracting for spare parts allowances provides "better" support at a lesser cost than Readiness Based Sparing (RBS),

it indicates that incentive-type contracts have the potential to improve allowance forecasting and spare parts budget defense processes. Sufficient funding for any program does not always guarantee the best support. However, this study has shown that innovative contracts, such as the hybrid incentive contract, coupled with sufficient funding, can lead to more accurate predictions in logistics spare parts allowancing. Accurate allowance forecasts provide decision makers with the information they need to make informed decisions during the PBBS resource allocation process. Additionally, better accuracy leads to increased credibility and confidence in our true logistic support needs. In turn, higher confidence in our allowancing forecasts makes it easier to support and defend spare parts budgets.

1. Primary Research Question

Can the U.S. Navy achieve a realistic AVCAL sufficient to support the fleet, by using a combination of contractor suggested allowances and incentive-type contracts? This study has provided possible advantages and disadvantages to using a hybrid incentive contract. It has also provided the major barriers that are limiting the "outsourcing" of depot repair and spare parts allowancing. Lastly this study has shown that theoretically, it is possible to achieve an

accurate and realistic allowance listing to support today's fleet, through the use of a combination of contractor suggested allowances and incentive-type contracts.

1. Subsidiary Questions

a. *Subsidiary Question #1*

How does the U.S. Navy currently calculate initial outfitting allowances? This study has shown how the United States Navy initially computed spare parts allowances through the use of a Demand Based System (DBS). When funding constraints became rampant, the Navy resorted to a Readiness Based System (RBS) of allowancing. Through the use of RBS, the Navy claims to have saved in excess of $30 million for each Aviation Consolidated Allowance List (AVCAL), while maintaining Chief of Naval Operation's (CNO's) mission capability goals.[34]

b. *Subsidiary Question #2*

How does the U.S. Navy currently fund initial outfitting allowances? As this study has shown, the funding process is a long, cumbersome process which starts with identifying a military requirement and eventually ends with spare parts in the fleet. Only at the end of the major weapon systems procurement, (fielding phase), does logistics

[34] CNA Briefing CAB 94-75 of January 1995.

funding become available. However, logistics funding is only provided by the Chief of Naval Operations staff (OPNAV) at 85 percent of the full funding requirements. Over the years, the military has found an alternative use for money originally earmarked for logistics support. As discussed in this study, much of the logistics funding ultimately has been used to support operational needs and requirements. Despite the formal logistic funding process outlined in PBBS, the military has not funded spare parts support requirements to appropriate levels.

c. ***Subsidiary Question #3***

What is Material Support Date (MSD) and why is it so important? Material Support Date (MSD) is the date in which the Government takes "control" of supporting a weapon system with spare parts support. Up until MSD, the logistical spare parts support is provided by a contractor, usually the Original Equipment Manufacturer (OEM). The "color" of money used to pay the contractor, prior to MSD is different than the "color" of money used after MSD.

The key to supporting any procurement in the military is prior planning. By planning the MSD, programmers and budget personnel are able to correctly identify the amounts and "colors" of money to be used in each year. If MSD is adjusted either forward or backward,

the amount and different type (color) of funding is no longer correctly budgeted. Eventually, one will have too much of one "color" and not enough of another "color" of money. This is why MSD is such an important factor in the budgeting of funds for logistics spare parts support.

d. *Subsidiary Question #4*

How does the incentive-type contract work? This study defined an incentive contract and provided the definitions from the Federal Acquisition Regulation (FAR). The incentive contract is used to motivate the contractor to meet a Government objective, such as a shorter Mean-Time-To-Repair (MTTR) or a longer Mean-Time-Between-Failure (MTBF). The contractor has the potential to earn greater profit if they meet or exceed the Government's specified goal.

e. *Subsidiary Question #5*

How will the use of an incentive-type Contract differ from how the U.S. Navy currently does business? The use of an incentive-type contract will not differ from the way the U.S. Navy currently does business. However, by using a "hybrid" incentive-type contract where goals are set by the contractor, the U.S. Navy has the potential to obtain superior performance and logistics support. By using the "hybrid" incentive-type contract for allowances, the U.S.

Navy will be able to work with contractors to accurately predict minimum allowances required to support the fleet. In accurately predicting allowances, budget personnel will in turn be provided with accurate pricing requirements needed for logistical support appropriations.

f. *Subsidiary Question #6*

What are the negative effects of using an incentive-type Contract for initial outfitting? The major negative effect of using an incentive-type contract for initial outfitting is the perceived loss of Government item manager and item manager analyst jobs.

As discussed in this study (chapter IV), there is a potential for the loss of Small Business Administration quotas not being filled, and a large potential of initiating sole source contracts to many large OEMs. A final negative impact, presented by this study, will be the possible repealment of the "60/40" rule (Title 10, United States Code 2466), which limits the amount of depot maintenance funding that can be spent outside the military. Once repealed, the possibility of outsourcing any and all positions and jobs within the military become possible.

g. *Subsidiary Question #7*

What will be the estimated cost or savings from using an incentive-type contract? In the three weapon systems presented in this study, savings are estimated at $80,397,687, and costs associated with the "hybrid" incentive contract range from $2,616,457 to $14,274,599. The calculated costs and savings above are the difference between the calculated cost of using the hybrid incentive contract and that of the OPNAV 85 percent funding. Estimated savings would be greater and costs would be smaller if compared to the cost of fully funding each weapon system presented. However, the reader should take note that all values are hypothetical, primarily due to the fact that each of the weapon systems presented in this study are still not fully funded.

h. *Subsidiary Question #8*

Does an incentive-type contract provide a "fair and equitable" contract, beneficial to both the Government and commercial suppliers? In interviews with U.S. Navy item managers and major defense contractors, the incentive contract provides a "fair and equitable" agreement for both the Government and the contractor. If the situation was not beneficial to both parties, one or the other party would not agree to the type of contract.

In the case of the "hybrid" contract, both military and defense contractors agree that letting the contractor "predict" his supportability, above the Government minimum requirements, is beneficial to all. Above all, the "hybrid" incentive contract provides the best benefits to the warrior, with the potential of improved spare parts support.

E. AREAS OF FURTHER RESEARCH

Other areas requiring further research are:

- If one were to look back five years and determine the U.S. Navy's logistics procurement appropriation shortfall, could one determine a correlation to today's fleet readiness?
- What other vehicles are available for predicting and producing spare parts allowances?
- How deficient is the logistics procurement account? If some of these funds were reprogrammed, what accounts received those funds? What is the net present value of the deferred costs of logistics supply support? Can we determine the cost of deferring prior year funds to the cost of procuring the same parts today?
- Can we use this hybrid incentive-type contract in other procurement areas, such as major weapon system, medical and subsistence support?

APPENDIX A. SAMPLE FIXED PROTECTION (RIMAIR) CALCULATION[35]

1. **Background.** Below is an example of how to calculate a Fixed Protection (RIMAIR) quantity.

2. **The Candidate.** For the purposes of this example, the item used, NIIN 1, is being outfitted for use on 10 carrier-based aircraft.

Table 1

Item Data

NIIN	Price	MRF	RPF	TAT	*Future Flying Hours	Endurance Period
NIIN 1	$75K	.082	.105	3.0 Days	270/aircraft	90

*Note: Future flying hours and endurance period are obtained from 013 via a confidential planning document which also provides the approved safety (protection) level threshold, number of aircraft and OST (if authorized). OST is not authorized in RIMAIR calculations at this time.

[35] Provided verbatim from Enclosure (1) of Appendix 1 from NAVICP Memo 0343:AP of 22 Nov 1994

3. Calculation

STEP 1. Calculate the Expended Maintenance Cycles

Expanded Maintenance Cycles =

$$\frac{\text{90 Days Future Flying Hrs per Aircraft X Number of Aircraft.}}{\text{100 (Constant value which refers to \# of flying hours in 1 maintenance cycle)}}$$

Using the information from Table 1 and assuming 013 Planning has specified one aircraft, the formula is applied as follows:

Expanded Maintenance Cycles =

$$\frac{\text{270 [Future Flying Hours] X 10 [Number of Aircraft]}}{100} = 27$$

Step 2. Calculate the Average Resupply Pipeline

Average Resupply Pipeline =

$$\frac{\text{MRF X Occurrences X 90 Days Expanded Maintenance Cycles X (Endurance Period + OST (expressed in days))(if authorized)}}{\text{90 (Constant. Represents number of days in a quarter)}}$$

where:

(1) MRF = Maintenance Replacement Factor (DEN F001)

(2) Occurrences = Total units per end item (e.g. aircraft)

(3) Expanded Maintenance Cycles = 27

(4) Endurance period = 90 (days) for deployed sites, 60 (days) for selected OCONUS shore sites and 30 (days) for CONUS shore sites (as specified in the 013 planning document in the NOTE in paragraph 2). Because the outfitting being computed in this example is for a deployed site, the endurance period is 90 days.

(5) OST (Order and Ship Time) is currently zero (days) for RIMAIR (or as specified in the 013 planning document. See the Note in paragraph 2.)

Using information from Table 1, the formula is applied as follows:

NIIN 1: (0.82 X 1 X 27 X 90) / 90 = 2.214

Step 3. Calculate the Average Repair Pipeline:

Average Repair Pipeline =

$$\frac{\text{RPF X Occurrences X 90 Days Expended Maint. Cycles X TAT}}{\text{90 (Constant. Represents number of days in a quarter)}}$$

where:

(1) RPF = Rotable Pool Factor (DEN F001A)

(2) TAT = I-Level Turn Around Time (DEN F010E)

Using information from Table 1, the formula is applied as follows:

NIIN 1: (0.105 X 1 X 27 X 3) / 90 = 0.095

STEP 4. Calculate Average Total Pipeline:

Average Total Pipeline =

Average Resupply Pipeline + Average Repair Pipeline

Using the results of steps 2 and 3, our example item yield the following :

NIIN 1: 2.214 + 0.095 = 2.309

Step 5. Determine Authorized Outfitting Quantity: Apply Average Total Pipeline to 85% Poisson protection level table.

Using the results of steps 1 - 4, our example item yields the following:

NIIN 1 Average Total Pipeline = 2.309, Authorized Outfitting = 4

APPENDIX B. MISSION CAPABLE (MC) AND FULL MISSION CAPABLE (FMC) GOALS BY TYPE/MODEL/SERIES (T/M/S) AIRCRAFT AND UNIT OPERATIONAL CATEGORY FOR CURRENT FISCAL YEAR[36]

1. Overall goals combine operational status category codes defined in OPNAVIST 5442.2F.

2. Operational category "A" aircraft goals are five percent higher than the overall goals.

3. Operational category "B" aircraft goals are the same as the overall goals.

4. Operational category "C", "D", and "E" aircraft goals are five percent lower than the overall goals.

	OVERALL	
T/M/S	MC GOAL	FMC GOAL
EA-3B	53	41
KA-3B	72	55
ERA-3B	53	41
TA-3B	68	52

[36] Verbatim listing of OPNAVINST 5440.2M CH-1 of 1 July 1992

T/M/S	OVERALL MC GOAL	OVERALL FMC GOAL
A-4E	65	50
A-4F	62	48
EA-4F	65	50
TA-4F	72	55
TA-4J	65	50
A-4M	68	52
OA-4M	73	56
EA-6A	58	40
EA-6B	73	54
KA-6D	69	53
A-6E	73	56
C-2A	67	52
TC-4C	75	54
C-9B	80	80
DC-9	80	80
C-130F	60	46
KC-130F	72	53
KC-130R	75	58

	OVERALL	
T/M/S	MC GOAL	FMC GOAL
EC-130G	80	65
EC-130Q	80	65
LC-130F	70	54
LC-130R	70	54
KC-130T	75	58
TC-130G	70	60
TC-130Q	70	60
C-20D	85	85
E-2C	70	54
TE-2C	75	68
E-6A	80	65
F-16N	90	90
TF-16N	90	90
RF-4B	70	54
F-4J	70	54
F-4S	75	58
F-5 SERIES	80	80

	OVERALL	
T/M/S	MC GOAL	FMC GOAL
F-14A/B	65	50
F-14D	71	61
F/A-18A	75	58
F/A-18B	60	46
F/A-18C	75	58
F/A-18D	60	46
AH-1J	85	75
AH-1T	85	75
AH-1W	85	75
UH-1E	75	58
TH-1L	85	75
HH-1K	85	75
UH-1N	85	75
HH-2D	90	85
SH-2F	71	54
HH-3A	74	57
UH-3A	60	46
VH-3A	90	90
SH-3D	70	54

	OVERALL	
T/M/S	MC GOAL	FMC GOAL
SH-3G	71	54
SH-3H	78	60
HH-46A	75	60
CH-46D	76	58
HH-46D	80	60
UH-46D	80	60
CH-46E	80	77
CH-53A	73	60
CH-53D	73	65
CH-53E	70	60
MH-53E	70	60
RH-53D	60	45
HH-60H	75	60
SH-60B	77	58
SH-60F	75	60
P-3A	75	58
P-3B	80	61
P-3C	85	61
EP-3A	72	55

T/M/S	MC GOAL	FMC GOAL
	OVERALL	
RP-3A	85	83
UP-3A	75	58
VP-3A	85	54
RP-3D	70	54
EP-3E	62	48
S-3A	70	54
S-3B	70	54
US-3A	70	54
ES-3A	70	50
T-2C	70	65
T-34C	80	80
T-39D	75	65
CT-39E	90	85
CT-39G	90	85
T-44A	80	80
T-45A	80	80

T/M/S	OVERALL MC GOAL	OVERALL FMC GOAL
U-8F	80	61
U-6A	90	90
AV-8B	76	70
TAV-8B	72	68
OV-10A	75	65
OV-10D	77	59

APPENDIX C. DEPARTMENT OF DEFENSE - BUDGET AUTHORITY BY APPROPRIATION (Dollars in Millions)[37]

	FY 1992	FY 1993	FY 1994	FY1995	FY 1996	FY 1997	FY 1998	FY 1999
Current Dollars								
Military Personnel	81,221	75,974	71,365	71,557	69,775	70,338	69,666	70,777
O&M	93,791	89,172	88,341	93,751	93,658	92,353	94,386	94,801
Procurement	**62,952**	**52,789**	**44,141**	**43,572**	**42,420**	**42,932**	**44,823**	**48,706**
RDT&E	36,623	37,974	34,567	34,522	34,972	36,404	36,600	36,079
Military Construction	5,254	4,554	6,009	5,426	6,893	5,715	5,089	4,301
Family Housing	3,738	3,941	3,501	3,393	4,260	4,131	3,807	3,477
Defense-wide Contingency								1
Revolving & Management Fund	4,587	4,503	4,354	5,260	3,061	7,534	1,892	400
Trust & Receipts	-5,733	-435	-809	-1,648	-331	-1,250	-1,214	-1,120
Deduct, Intragovernment Receipt	-550	-1,069	-104	-180	-291	-186	-141	-164
Total, Current $	281,883	267,402	251,364	255,652	254,417	257,971	254,909	257,258
Constant FY 1998 Dollars								
Military Personnel	98,824	88,595	81,199	79,482	75,754	75,247	71,667	70,777
O&M	109,807	101,674	98,400	102,352	99,988	96,467	96,078	94,901
Procurement	**71,028**	**58,389**	**47,925**	**46,473**	**44,490**	**44,326**	**45,571**	**48,706**
RDT&E	41,646	42,311	37,751	36,981	36,761	37,612	37,217	36,079
Military Construction	5,957	5,060	6,545	5,807	7,249	5,914	5,181	4,301

[37] Information gathered from the Secretary of Defense address to Congress and the President found at: http://www.dtic.mil/execsec/adr98/apdx_b.html

Military Construction	5,957	5,060	6,545	5,807	7,249	5,914	5,181	4,301
Family Housing	4,241	4,375	3,807	3,625	4,466	4,261	3,866	3,477
Defense-wide Contingency								1
Revolving & Management Fund	5,261	5,030	4,592	5,662	3,245	7,783	1,935	400
Trust & Receipts	-6,521	-483	-881	-1,761	-347	-1,287	-1,232	-1,120
Deduct, Intragovernment Receipt	-626	-1,188	-114	-192	-305	-191	-143	-164
Total, Constant $	329,619	303,763	279,090	278,429	271,301	269,133	260,139	257,258
% Real Growth								
Military Personnel	-6.2	-10.4	-8.4	-201.0	-4.7	-2.0	-3.5	-1.3
O&M	-20.3	-7.4	-3.2	4.0	-2.3	-3.5	-0.4	-1.3
Procurement	**-14.2**	**-17.8**	**-17.9**	**-3.0**	**-4.3**	**-0.4**	**2.8**	**6.9**
RDT&E	-1.4	1.6	-10.8	-2.1	-0.6	2.3	-1.1	-3.1
Military Construction	-1.1	-15.1	29.3	-11.3	24.8	-18.4	-12.4	-17.0
Family Housing	10.9	3.1	-13.0	-4.8	23.2	-4.6	-9.3	-10.1
Total	0.1	-7.9	-8.1	-0.2	-2.6	-0.8	-3.4	-1.1

APPENDIX D. SAMPLE RBS CALCULATION[38]

1. **Background.** The following example is provided to illustrate the calculations performed by the ARROW's model in computing outfittings using Readiness Based Sparing (RBS). The example is necessarily oversimplified due to the large number of calculations required for even a handful of items. While it is not practical to show every computation for this example, the general logic followed by the ARROW's model will be useful in understanding RBS stockage decisions.

2. **The Candidates.** This example will consider an outfitting for a carrier that deploys one aircraft which operates one unit system X, comprised of 3 WRAs, NIIN 1, NIIN 2, NIIN 3. These items are the same as those used in the Sample Fixed Protection (RIMAIR) calculation in Appendix A. The reliability, maintainability and cost of the items is shown below:

[38] Provided verbatim from Enclosure (4) of Appendix 1 from NAVICP Memo 0343:AP of 22 Nov 1994

Table 1

Item Data

NIIN	Price	MRF	RPF	TAT	OST	"O" Level Maint Time	Future Flying Hours
NIIN1	$100K	.102	.557	4.0 Days	25 Days	3 Hrs	3400
NIIN2	$138K	.229	.112	8.8 Days	25 Days	3 Hrs	3400
NIIN3	$129K	.384	.103	5.4 Days	25 Days	3 Hrs	3400

Note: Future flying hours and endurance period are obtained from 013 via a confidential planning document which also provides the appropriate safety (protection) level threshold, number of aircraft and authorized OST for RIMAIR.

3. **Calculation.**

Step 1. Calculate the Expanded Maintenance Cycles

Expanded Maintenance Cycles =

$$\frac{\text{90 Days Future Flying Hrs per Aircraft X Number of Aircraft}}{\text{100(Constant value which refers to \# flying hrs in 1 maintenance cycle)}}$$

(Note: Future flying hours are obtained via a confidential planning memo from 013 which stipulates the endurance period and advises whether or not safety level and OST (for RIMAIR calculations) is authorized)

Using the information from Table 1, the formula is applied as follows:

Expanded Maintenance Cycles = 3400 / 100 = 34

Step 2. Calculate the Average Resupply Pipeline

Average Resupply Pipeline =

$$\frac{\text{MRF X Occurrences X Expanded Maintenance Cycles X (Endurance Period + OST (Expressed as days)}}{\text{90 (Constant. Represents number of days in a quarter)}}$$

where:

(1) MRF = Maintenance Replacement Factor (DEN F001)

(2) Occurrences = Total units per end item (e.g. aircraft)

(3) Expanded Maintenance Cycles = 34

(4) Endurance period = Zero (days) for RBS

(5) OST (Order and Ship Time) is currently 25 (days) for RBS.

Using information from our examples, the formula is applied as follows:

TABLE 2

Average Resupply Pipeline

NIIN 1: (0.102 X 1 X 34 X 25) / 90 = 0.963

NIIN 2: (0.229 X 1 X 34 X 25) / 90 = 2.163

NIIN 3: (0.384 X 1 X 34 X 25) / 90 = 3.627

Step 3. Calculate the Average Repair Pipeline:

Average Repair Pipeline =

$$\frac{\text{RPF X Occurrences X Expanded Maintenance Cycles X TAT}}{\text{90 (Constant. Represents the number of days in a quarter)}}$$

where:

(1) RPF = Rotable Pool Factor (DEN F001A)

(2) TAT = I-Level Turn Around Time (DEN F010E)

Using information from our examples, the formula is applied as follows:

Table 3

Average Repair Pipeline

NIIN 1: (0.557 X 1 X 34 X 4.0) / 90 = 0.842

NIIN 2: (0.112 X 1 X 34 X 8.8) / 90 = 0.372

NIIN 3: (0.103 X 1 X 34 X 5.4) / 90 = 0.210

STEP 4. Calculate Average Total Pipeline:

Average Total Pipeline =

Average Resupply Pipeline + Average Repair Pipeline

Using the results of steps 2 and 3, our example items yield the following:

Table 4

Average Repair Quantities

NIIN	Repair Pipeline	Resupply Pipeline	Total Pipeline
NIIN 1	0.842	0.963	.1.805
NIIN 2	0.372	2.163	2.535
NIIN 3	0.210	3.627	3.837

STEP 5. Compute Expected Backorders. The total Pipeline from Table 2 is used as the mean in a Poisson Distribution to compute the average number of backorders that would occur (expected Backorders (EBO)) for each level of stock. The range of stock levels for which these calculations are performed is affected by parameters that determine the

minimum and maximum quantity allowed for each item. In order to better illustrate how RBS makes its computations, this example starts with a minimum of 0 and a maximum equal to the quantity that yields 99.9% protection against having a backorder at a point in time. In execution, current ASO policy is to ensure a minimum of 50% an a maximum of 99.0% protection. When the stock level is zero, the expected backorders equals the Average Total Pipeline. Expected backorders for a level of stock is equal to the expected backorders for stocking one less item than the level being evaluated minus the risk of a backorder. This can be expressed as:

EBO(X) = EBO (X-1) - BACKORDER RISK (X-1)

where: X is the stock level being evaluated

The results for this example are shown in Table 5:

Table 5

Expected Backorders and Protection Levels

NIIN 1			NIIN 2			NIIN 3		
Stk	EBO	Protection	Stk	EBO	Protection	Stk	EBO	Protection
0	1.805	16.4%	0	2.535	7.9%	0	3.837	2.2%
1	.969	46.1%	1	1.614	28.0%	1	2.585	10.4%
2	.431	72.9%	2	.895	53.5%	2	1.963	26.3%
3	.160	89.0%	3	.429	75.0%	3	1.226	46.6%
4	.051	96.3%	4	.179	88.6%	4	.692	66.1%
5	.014	98.9%	5	.066	95.6%	5	.352	81.0%
6	.003	99.7%	6	.021	98.5%	6	.162	90.6%
7	.001	99.9%	7	.006	99.5%	7	.068	95.8%
			8	.002	99.8%	8	.026	98.3%
			9	<.001	99.9%	9	.009	99.4%
						10	.003	99.8%
						11	.001	99.9%

STEP 6. Compute Average Total "O" Level Removal to Replacement Times. The "O" level maintenance time from Table 1 indicates it takes 3 hours to remove and replace each WRA given a ready-for-issue (RFI) unit is in stock. In execution, removal to replacement times (RRTs) or Mean Time

to Repair (MTTRs) are set to the aircraft average for every item. This average is ascertained by SPCC 046 based upon 3M observations. The average "O" level RRT must include the average time it takes to obtain a RFI unit from supply, as well as the "O" level maintenance time. This average supply delay time per removal is zero if a RFI unit is in stock. If an RFI unit is not in stock, the average supply delay time represents the time until the next RFI unit will emerge from either the repair or resupply pipeline. The probability of having a RFI unit in stock increases as authorized depth increases. The supply delay therefore decreases as the stock level increases. The supply delay time is computed be dividing the expected backorders from Table 3 by the removal rate per hour. Removal rate per hour is obtained using the following formula:

Removal Rate =

((MRF + RPF) X Expanded Maintenance Cycles) / 2160

where: 2160 is the number of hours in a quarter.

The results of the supply delay time calculations for the example are shown below:

TABLE 4

Supply Delay Times

NIIN 1		NIIN 2		NIIN 3	
Stock	Supply Delay	Stock	Supply Delay	Stock	Supply Delay
0	174 hours	0	472 hours	0	500 hours
1	94 hours	1	300 hours	1	373 hours
2	42 hours	2	167 hours	2	256 hours
3	15 hours	3	80 hours	3	160 hours
4	5 hours	4	33 hours	4	90 hours
5	1 hour	5	12 hours	5	45 hours
6	< 1 hour	6	4 hours	6	21 hours
7	< 1 hour	7	1 hour	7	9 hours
		8	< 1 hour	8	3 hours
		9	< 1 hour	9	1 hour
				10	< 1 hour
				11	< 1 hour

NOTE: adding the "O" level maintenance time (3 hours) to the supply delay time represents the total removal to replacement time for the "O" level.

STEP 7. Compute Item Operational Availability (A_0). The are several ways to compute operational availability for

System X. Current NAVSUP policy is to assume that each item operates independently of al others. The operational availability of each item is computed for each stock level using the removal rate and the "O" level removal to replacement time which is derived from Table 4. The results are shown below.

TABLE 5

Item Operational Availability (A_0)

NIIN 1 Stock	NIIN 1 (A_0)	NIIN 2 Stock	NIIN 2 (A_0)	NIIN 3 Stock	NIIN 3 (A_0)
0	35.3%	0	28.2%	0	20.6%
1	50.0%	1	38.0%	1	25.8%
2	68.4%	2	52.3%	2	33.5%
3	84.0%	3	69.2%	3	44.5%
4	92.4%	4	83.7%	4	58.3%
5	95.7%	5	92.4%	5	73.1%
6	96.7%	6	96.4%	6	84.4%
7	96.9%	7	97.8%	7	91.6%
		8	98.3%	8	95.3%
		9	98.4%	9	96.9%
				10	97.5%
				11	97.7%

STEP 8. Compute Cost Effectiveness. The cost effectiveness of each stock level for each item is determined based on the cost of reducing supply delay time (hereafter referred to as SDT). The cost effectiveness ratio (CE Ratio) is computed using the following equation:

CE Ration = Price / Decrease in SDT X Item Removal Rate

where: Item Removal Rate =

(MRF+RPF) X Expanded Maintenance Cycles / 2160

For NIIN 1 the Price is $100,000, the SDT (for stock = 0) is 174, the SDT (for stock = 1) is 94, and the item removal rate = (0.102 + 0.557) X 34 / 2160:

CE Ratio (NIIN 1, Stock = 1) =

$100,000 / [(174-94) X 0.010373148] = 120.5

TABLE 6

Cost to Reduce Supply Delay

NIIN 1		NIIN 2		NIIN 3	
Stock	CE Ratio	Stock	CE Ratio	Stock	CE Ratio
1	120	1	150	1	132

2	186	2	192	2	144
3	369	3	297	3	175
4	913	4	552	4	242
5	2720	5	1215	5	380
6	9514	6	3108	6	679
7	38314	7	9082	7	1367
		8	29940	8	3071
		9	109890	9	7634
				10	20877
				11	62112

STEP 9. Rank Items and compute FMC Rates. The RBS selection list is created based on the cost of effectiveness ratio of the item stock levels shown in Table 6. The initial FMC rate before electing any item for stockage is computed by multiplying together the item A_0s shown in Table 5 for a stock level of zero on each item. For System X, this yields an initial FMC rate of 2.0%. This percentage represents the percentage of time System X will be operational even though no spares were selected. The results for System X are shown in TABLE 7.

TABLE 7

RBS Selection List

CE Ratio	Item	Cumulative Stock	Cumulative Total Cost (000s)	System X FMC
120	NIIN 1	1	$100	2.9%
132	NIIN 3	1	$229	3.6%
144	NIIN 3	2	$358	4.7%
150	NIIN 2	1	$496	6.4%
175	NIIN 3	3	$625	8.4%
186	NIIN 1	2	$725	11.6%
192	NIIN 2	2	$863	15.9%
242	NIIN 3	4	$992	20.9%
297	NIIN 2	3	$1130	27.6%
369	NIIN 1	3	$1230	33.9%
380	NIIN 3	5	$1359	42.5%
552	NIIN 2	4	$1497	51.4%
679	NIIN 3	6	$1626	59.3%
913	NIIN 1	4	$1726	65.2%
1215	NIIN 2	5	$1864	72.0%
1367	NIIN 3	7	$1993	78.3%
2720	NIIN 1	5	$2093	81.1%
3071	NIIN 3	8	$2222	84.3%
3108	NIIN 2	6	$2360	87.9%

7634	NIIN 3	9	$2489	89.4%
9082	NIIN 2	7	$2627	90.7%
9514	NIIN 1	6	$2727	91.5%
20877	NIIN 3	10	$2856	92.2%
29940	NIIN 2	8	$2994	92.6%
38314	NIIN 1	7	$3094	92.8%
62112	NIIN 3	11	$3223	93.0%
109890	NIIN 2	9	$3361	93.1%

STEP 10. Select Stockage Decisions. The stockage decisions are selected from TABLE 7 based on either a cost or FMC goal. If the FMC goal for System X is 90.0%, we see form table 7 that we can achieve 90.7% FMC with 5 units of NIIN 1, 7 units of NIIN 2 and 9 units of NIIN 3 at a cost of $2627K.

APPENDIX E. THE BONUS INCENTIVE MODEL[39]

In developing this model, we sought to identify overriding objectives that managers would desire given an ideal incentive structure. Gonik (1978) in his study of an effective incentive system for salesmen identified the following objectives:

1. Reward salesmen for his production.
2. Reward salesmen equitably for his effort.
3. Obtain current and reliable field information on market potential to make efficient resource decisions.

<u>Goals of the Bonus Incentive Model</u>

The bonus incentive model is an alternative to the current quota system that incorporates the above objectives. Highlights of the incentive model are as follows:

1. Provides an incentive for recruiters to surpass quotas and thereby maximizes true market potential.
2. Rewards recruiters with monetary bonuses based on their work effort and their ability to forecast.
3. Rewards recruiters equitably despite inherent regional market differences in the long run.
4. Provides, in the long run, [United States Army Recruiting Command] USAREC headquarters with valuable market

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[39] Provided verbatim from the article *Quota Based Recruiting System and Bonus Incentive Recruiting*

information that allows for efficient future resource reallocation to the productive regions.

5. Based on improved forecasting information, the bonus model indirectly reduces staff workload and minimizes the variance in the mission process.
6. Model is adjustable to reflect changing Army accession requirements.
7. Model is capable of maintaining quality marks.

The key to this incentive structure is to link the recruiters market forecast to his actual production. Under this system, the recruiter is rewarded not only for his production but for his accuracy of his forecast. *The higher and more accurate the forecast, the higher the recruiter's reward will be.* This reward incentive encourages recruiters to maximize their market potential which in turn provides USAREC with the accurate market information needed to reallocate resources to more productive regions.

Table 5 shows a possible scenario of recruiter bonus payments. The recruiter (or recruiting station) must forecast his performance over a specified period (monthly or quarterly). After the actual results are tabulated at the end of the period the recruiter goes to the bonus table and aligns his actual production with his forecast to determine his bonus for that period. Notice that for a given forecast

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Model, by Katsuaki L. Terasawa and Keebom Kang, dated 12 October, 1996

the bonus is larger for a greater production. Also notice that for a given production, the bonus is larger when the forecast becomes more accurate. For example, given a predicted value of 12, the bonus payment increases as production increases. A recruiter gains additional payment as they overproduce. On the other hand, at a given production of 12, if the recruiter has predicted 12, the bonus payment would be 188, while under- or over-prediction would result in lower bonus payment. In order to maximize his bonus the recruiter must *forecast* exactly what he truly believes. The key for success is for the recruiter to be unbiased in his reporting, which will also benefit management. Thus, we call the mechanism *truth revealing* since the recruiter has the incentive to reveal his true market potential. Over time a recruiter's forecast will come to reflect the unbiased estimate of applicants available in the market.

Under the bonus incentive program both the recruiters and management will benefit. From the recruiter's perspective, he receives two important benefits:

1. A bonus tied to production and work effort.
2. A more equitable compensation for their effort (in the long run) through redeployment of recruiters.

Management benefits since the bonus incentive program will:

1. Realize true market potential.
2. Provide better information concerning market potential for a given region to facilitate efficient resource allocation.
3. Over time, close the gap between forecasts and actual results. Therefore a recruiter's forecast will come to reflect the true mean or expected value of the market which benefits management's accessions planning.

P		*FORECAST*						
R		*10*	*11*	*12*	*13*	*14*	*15*	*16*
O	10	**100**	98	92	82	68	50	28
D	11	140	**142**	140	134	124	110	92
U	12	180	186	**188**	186	180	170	156
C	13	220	230	236	**238**	236	230	220
T	14	260	274	284	290	**292**	290	284
I	15	300	318	332	342	348	**350**	348
O	16	340	362	380	394	404	410	**412**
N								

Table 5.

Therefore, even though total forecast accuracy may never be realized, the main objective of [Bonus Incentive Recruiting Model] BIRM will have been met; enhanced production volume, more equitable reward structure, and improved field information.

Accounting for Regional Market Differences

One of management's objectives is to compensate recruiters equitably based on their work effort. We have all heard the stories of recruiters in one region with lines of applicants waiting in his office, while a recruiter in a different region has to struggle to meet his mission. Under the proposed system both recruiters are compensated equally. Currently, recruiters perceive the quota system as unfair since they believe some recruiters must work harder than others to achieve their quotas. However, any efforts to reduce the inequity by simply adjusting the bonus level could be inefficient. Instead, we suggest that the management should consider reallocation of resources. It could relocate recruiters to the richer markets from the poorer ones by using the now-available market potential information. The efficient reallocation of resources would ensure when each (marginal) dollar of resources spent would buy the same number of quality recruits. In this way, the bonus incentive could enhance both the level of equity and its efficiency in the long run.

Adjusting to Changes in Manpower Requirements

As with most aspects of Department of Defense, the manpower procurement system is dynamic. Changes in recruit

requirements are frequent. Since the bonus incentive schedule reflects the marginal cost of acquiring the desired level of recruit requirements, the schedule could be adjusted accordingly. For example, if actual production is ahead of requirements, the bonus schedule can be adjusted to lower recruiter incentives, thereby reducing the flow of applicants. By the same token, payment schedules may be increased to enhance recruiter effort to increase the number of applicants.[*] Using the bonus model in conjunction with historical production data, management could better estimate the cost associated with increased production levels.

Sustaining Recruit Quality Marks[#]

Not all recruiting quality categories require the same work effort to obtain. For example, high school graduates are more difficult to recruit than non-high school graduates. Therefore, due to the differences, more than one bonus incentive schedule may be published based on quality levels. In general, the bonus schedule should reflect both the supply and demand factors of a particular recruit category.

[*] However, there still remains a question of how frequently such adjustments should be made to lessen the effect of gaming. The issue will be addressed in our future research work.

[#] The bonus incentive schedule can reflect factors other than quality marks that influence the scarcity value of recruit category. For example, they may include the end-strength number as well as the military occupational specialty requirement.

Conclusion

The current quota structure implies potential inefficiencies in its resource allocation. Moreover, the usefulness of current data analysis, which does not filter out the quota incentive problems, may be limited. The proposed bonus incentive program seeks a way to maximize market potential and provide management with better information to allow for efficient reallocation of personnel and budget. Currently the variant of this Bonus Incentive Recruiting Model is being experimented in a small-scale within the USAREC. Further study and research is required for large-scale implementation and to develop regional market and recruiter work effort variables.

Appendix 2.

Development of Bonus Incentive Recruiting Model (BIRM)

(i) *Properties of BIRM:*

The development of the Bonus Incentive Recruiting Model (BIRM) is based on the Osband-Reichelstein model (see Besen and Terasawa, 1989; Reichelstein, 1990). Similar to the Osband-Reichelstein model, BIRM ensures truth revelation based on the recruiter's forecast, *F*, and his actual

production, *P*. In fact, such truth-revealing bonus payment, B, must have the following properties:

$$B=a(F)+b(F)*(P-F)$$

1. The first component of the bonus or the base bonus, a(F), depends on the recruiter's forecast, F. The higher the forecast, the greater the base bonus, a(F), i.e., the first derivative of a must be positive, $a'=da/dF>0$. Moreover, the level of the increase in base bonus, should be greater with an increase of F, i.e., the second derivative of a must be positive, $a''=d^2a/dF^2>0$.
2. The second component of the bonus or the incentive pay, b(F)*(P-F), depends on the difference between the forecast and the actual production. If the production exceeds the recruiter's forecast, P-F, he gets an additional reward of b(F) per unit of excess production. If , on the other hand, the production falls short of the forecast, P<F, he is penalized by b(F) per unit of shortfall. We will call b(F) as an incentive parameter. When his production matches his forecast, then his bonus depends entirely on the base bonus, a(F).
3. The incentive parameter, b(F), is set equal to the marginal change of the base bonus with respect to F, i.e., the incentive parameter must equal the first derivative of the base bonus, b(F)=a'.

For example, suppose we have $a(F)=2F^2-100$ as the base bonus for the range of F between ten and seventeen. Then the incentive parameter, b, is given by, $b(F)=da/dF=4F$. a and b both satisfy the sign conditions described above: a, b, a′ and a″ are all positive for the relevant range of F ($10 \le F \le 17$). The bonus function becomes:

$$B=2F^2-100+4F*(P-f) \qquad (A\text{-}3.1)$$

It is easy to see that for a given level of expected production, $E(P)=\mu$, the expected bonus is maximized when the recruiter's forecast is unbiased, i.e., $F=\mu$. From Equation (A-3.1), we have the expected bonus, E(B), as:

$$E(B)=2F^2-100+4F*(\mu-F) \qquad (A\text{-}3.2)$$

After differentiating the above expression with respect to F and setting it equal to zero, we have: $dE(B)/dF=0=4*(\mu-F)$, which implies $F=\mu$. Since the second derivative is negative, $d^2E(B)/dF^2=-4<0$, the expected bonus is maximized when $F=\mu$, or when the recruiter's forecast is his unbiased estimate. Table A-1 illustrates the base bonus, a, and the incentive parameter, b, as a function of forecast. The bonus payment is shown in Table 5 in the text as a function of both forecast and production.

	FORECAST						
	10	*11*	*12*	*13*	*14*	*15*	*16*
a(F)	100	142	188	238	292	350	412

b(F)	40	44	48	52	56	60	64

Table A-1. Base Bonus, a(F), and Incentive Parameter, b(F) as a function of Forecast.

(ii) Utility Maximization Foundation:

In order to examine the interplay of recruiter's work-effort and the bonus system, we construct a simple utility analysis framework. We begin with the recruiter's utility function, U(Y), which is a concave function of his net income equivalent, Y. His utility increases with Y but at a diminishing rate. His net income depends on both the bonus, B, and the monetary equivalent of his work effort, cW. C converts work effort, W, into monetary measure. For illustration, we assume an additive utility function of the form $U=U(Y)=Y^s=(B-cW)^s$ where s denotes the level of a recruiter's risk aversion, $0 \le s \le 1$. Since $B = a(F)+b(F)*(P-F)$, the expected utility is given by,

$$V=E[U]=a(F)+b(F)*(\mu-F)-cW \qquad \text{(A-3.3)}$$

The expected production, μ, depends on both the recruiter's work effort, W, as well as other market environment, μ_0. We assume that it is given by the following simple Cobb-Douglas production function

$$\mu=\mu(\mu_0,W)=\mu_0 W^k \qquad \text{(A-3.4)}$$

The market environment, μ_0, must be positive since it represents how accession-rich an area is. An increase in μ_0

represents an increase in accession opportunity for the given market. The parameter k must be between zero and one. The k ensures a condition of diminishing returns in the work effort and accessions is impossible, since at some point, no matter how hard the recruiter works, he cannot produce more accessions.

Therefore, the recruiter's expected utility becomes:

$$V=E[U]=a(F)+b(F)*(\mu_0 W^k-F)-cW \qquad \text{(A-3.5)}$$

Next, we want to maximize the recruiter's expected utility, V, with respect to his forecast and work effort. Since we want the mechanism to be truth revealing $\dot{\mu}$ must equal F, which means we must have:

$\mu_0 W^k - F = 0$ as a side condition.

The first partial derivatives of V with respect to F and W are:

$$dV/dF = a' + b'*(\mu_0 W^k - F) - b' = 0$$

simplified:

$$a' = b \qquad \text{(A-3.6)}$$

$$dV/dW = b * (k\mu_0 W^{k-1}) - c = 0$$

Simplified:

$$W = (bk\mu_0/c)^{1/(k-1)} \qquad \text{(A-3.7)}$$

The second derivatives with respect to F:

$$d^2V/dF^2 = a'' + b'' * (\mu_0 W^k - F) - 2b' < 0$$

Simplified:

$a'' - 2b' < 0$

Since we have $a' = b$ and $a'' = b'$ from equation (A-3.6):

$$a'' > 0 \qquad \text{(A-3.8)}$$

The second derivatives with respect to W:

$$d^2V/dW^2 = b * (k-1)(k\mu_0 W^{k-2}) < 0 \qquad \text{(A-3.9)}$$

Simplified:

$$a' * k(k-1)\mu/W2 < 0$$

The second derivatives with respect to (F, W):

$$d^2V/dF\,dW = b' * (k\mu_0\ W^{k-1}) = a'' * (k\mu_0\ W^{k-1}) \qquad \text{(A-3.10)}$$

Thus the second order condition for the maximization is represented by the following determinant which must be positive:

$$\begin{vmatrix} -a'' & a''\mu_0\mu/W \\ a''\mu_0\mu/W & a'k(k-1)\mu/W^2 \end{vmatrix} = ((a''\mu)/W^2)(a'k(k-1) - a''\mu 0\mu) > 0$$

which implies $a'' < (a'k(k-1))/\mu_0\mu$ (A-3.11)

Suppose we assume that the base bonus payment, $a(F)$, as the follows:

$$a(F) = F^n/D - S \qquad \text{(A-3.12)}$$

where D and S represent management tool used to increase or decrease the base payment to adjust for changes in target accession totals, unemployment or other economic conditions. Then the incentive parameter, $b(F)$ becomes:

$$b(F) = nF^{n-1}/D \qquad \text{(A-3.13)}$$

Additionally, our work effort function, W, based on Equation (A-3.7) becomes:

$$W=\{(nF^{n-1}/D)*\mu_0 k/c\}^{1/(k-1)} \Longrightarrow W=\{nk\mu_0^{n}/(cD)\}^{1/(2k-1-kn)} \qquad (A-3.14)$$

The Bonus Incentive in the text was developed based on the risk-averse version of the above case. It incorporates the recruiter's work effort, risk-averseness and market environment and base payment (see Terasawa, 1993 for more details).

APPENDIX F. SAMPLE INCENTIVE TYPE CONTRACT

1. The following example is provided to show how the incentive contract model would work. It is a Fixed Price - Incentive Type Contract. The numbers used can be adjusted based upon the contracting officer's opinion and determination of risk and negotiated profit.

   Target Cost: $13,600,000.

   Target Profit: $1,000,000.

   Target Price: $14,600,000.

   Ceiling Price: $16,320,000.

   Maximum Incentive: $1,000,000.

   Share Ratio: 70/30

2. During pre-MSD, the contractor calculates his MTBF. This calculated MTBF is then compared to the minimum Government MTBF requirements. Using these two figures, the contractor and the contracting officer can review the possible outcomes from table 1.

3. In this first example, the contractor predicts his product's MTBF to be equivalent to Government Minimum plus 25 percent. After one year of performance, the contractor's product MTBF is evaluated and the MTBF is found to be 2 percent below the Government's minimum requirements.

   Final Negotiated Cost: $14,000,000.

Profit:

$1,000,000-[$14,000,000 - $13,600,000]*0.3 = $880,000.

Incentive/Penalty (from Table): -$220,000

Price to Government:

$14,000,000 + $880,000 - $220,000 = $14,660,000

Percent Profit to the Contractor:

$660,000 / $14,000,000 = 4.71%

4. In the second example, the contractor predicts his product's MTBF to be equivalent to Government Minimum plus 25 percent. After one year of performance, the contractor's product MTBF is evaluated and the MTBF is found to be as predicted.

   Final Negotiated Cost: $14,000,000.

   Profit:

   $1,000,000 - [$14,000,000 - $13,600,000]*0.3 = $880,000.

   Incentive/Penalty (from Table): $558,406

   Price to Government:

   $14,000,000 + $880,000 + $558,406 = $15,438,406

   Percent Profit to the Contractor:

   $1,438,406 / $14,000,000 = 10.27%

5. In the third example, the contractor predicts his product's MTBF to be equivalent to Government Minimum plus 25 percent. After one year of performance, the contractor's product MTBF is evaluated and the MTBF is

found to be better than his original prediction (Government Minimum + 35 percent).

Final Negotiated Cost: $14,000,000.

Profit:

$1,000,000 - [$14,000,000 - $13,600,000]*0.3 = $880,000.

Incentive/Penalty (from Table): $644,969

Price to Government:

$14,000,000 + $880,000 + $644,969 = $15,524,969

Percent Profit to the Contractor:

$1,524,969 / $14,000,000 = 10.89%

6. This final example will be used to show that if the contractor had predicted his MTBF to be Government Minimum plus 35 percent, vice 25 percent, his profit would be much greater. We will assume the contractor has predicted a MTBF of Government Minimum plus 35 percent. After one year the contractor's performance has been evaluated and his MTBF is found to be meet his original prediction (Government Minimum plus 35 percent).

Final Negotiated Cost: $14,000,000.

Profit:

$1,000,000 - [$14,000,000 - $13,600,000]*0.3 = $880,000.

Incentive/Penalty (from Table): $704,969

Price to Government:

$14,000,000 + $880,000 + $704,969 = $15,584,969

Percent Profit to the Contractor:

$1,584,969 / $14,000,000 = 11.32%

As mentioned in the Besen-Terasawa study, this type of computation table for assigning incentive awards, lends itself to truth in predictions. Too many times, the contractor has assigned Mean-Time-Between-Failure (MTBF) numbers to the government, only to have actual MTBF be significantly lower than "advertised." Thus, leaving the services no option but to buy more of the required parts at a profit to the contractor. By using this incentive table, the contractor is using his own values to achieve his future expected profit. If those numbers are incorrect, the contractor, not the military services, will be penalized.

Critics may claim that if the contractor is penalized, then the Government, too, loses out in the form of incorrect or insufficient part allowancing. The author's answer and argument is that currently we are allowancing based upon information provided by the contractor. If that information is incorrect, only the government loses out The contractor eventually gains profits by the additional procurements the Government must make to support the fleet. At a minimum, in using the Besen-Terasawa "hybrid" the Government "gains" from having the contractor "penalized" because of his own predictions.

		PREDICTION										
		Govt Min	Govt Min+5%	Govt Min+10%	Govt Min+15%	Govt Min+20%	Govt Min+25%	Govt Min+30%	Govt Min+35%	Govt Min+40%	Govt Min+45%	Govt Min+50%
	Govt Min-5%+	-$100,000	-$140,000	-$180,000	-$220,000	-$260,000	-$300,000	-$340,000	-$380,000	-$420,000	-$460,000	-$500,000
	Govt Min-5%	-$60,000	-$100,000	-$140,000	-$180,000	-$220,000	-$260,000	-$300,000	-$340,000	-$380,000	-$420,000	-$460,000
	Govt Min-2%	-$20,000	-$60,000	-$100,000	-$140,000	-$180,000	-$220,000	-$260,000	-$300,000	-$340,000	-$380,000	-$420,000
	Govt Min	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
A	Govt Min+5%	$0	**$350,356**	$330,356	$290,356	$250,356	$210,356	$170,356	$130,356	$90,356	$50,356	$10,356
C	Govt Min+10%	$0	$373,659	**$393,659**	$373,659	$333,659	$293,659	$253,659	$213,659	$173,659	$133,659	$93,659
T	Govt Min+15%	$0	$382,313	$422,313	**$442,313**	$422,313	$382,313	$342,313	$302,313	$262,313	$222,313	$182,313
U	Govt Min+20%	$0	$396,981	$436,981	$476,981	**$496,981**	$476,981	$436,981	$396,981	$356,981	$316,981	$276,981
A	Govt Min+25%	$0	$418,406	$458,406	$498,406	$538,406	**$558,406**	$538,406	$498,406	$458,406	$418,406	$378,406
L	Govt Min+30%	$0	$447,422	$487,422	$527,422	$567,422	$607,422	**$627,422**	$607,422	$567,422	$527,422	$487,422
	Govt Min+35%	$0	$484,969	$524,969	$564,969	$604,969	$644,969	$684,969	**$704,969**	$684,969	$644,969	$604,969
	Govt Min +40%	$0	$532,100	$572,100	$612,100	$652,100	$692,100	$732,100	$772,100	**$792,100**	$772,100	$732,100
	Govt Min+45%	$0	$590,000	$630,000	$670,000	$710,000	$750,000	$790,000	$830,000	$870,000	**$890,000**	$870,000
	Govt Min+50%	$0	$660,000	$700,000	$740,000	$780,000	$820,000	$860,000	$900,000	$940,000	$980,000	**$1,000,000**

TABLE G-1.

APPENDIX G. TITLE 10 UNITED STATES CODE SECTION 2466[40]

-CITE-

10 USC Sec. 2466 01/06/97

-EXPCITE-

TITLE 10 - ARMED FORCES

Subtitle A - General Military Law

PART IV - SERVICE, SUPPLY, AND PROCUREMENT

CHAPTER 146 - CONTRACTING FOR PERFORMANCE OF CIVILIAN COMMERCIAL OR INDUSTRIAL TYPE FUNCTIONS

-HEAD-

Sec. 2466. Limitations on the performance of depot-level maintenance of materiel

-STATUTE-

(a) Percentage Limitation. - Not more than 40 percent of the funds made available in a fiscal year to a military department or a Defense Agency for depot-level maintenance and repair workload may be used to contract for the performance by non-Federal Government personnel of such workload for the military department or the Defense Agency.

[40] U.S. Code cited verbatim as found on the U.S. House of Representatives web site at; http://law2.house.gov/

Any such funds that are not used for such a contract shall be used for the performance of depot-level maintenance and repair workload by employees of the Department of Defense.

((b) Renumbered Sec. 2472(a))

(c) Waiver of Limitation. - The Secretary of the military department concerned and, with respect to a Defense Agency, the Secretary of Defense may waive the applicability of subsection (a) for a fiscal year, to a particular workload, or to a particular depot-level activity if the Secretary determines that the waiver is necessary for reasons of national security and notifies Congress regarding the reasons for the waiver.

(d) Exception. - Subsection (a) shall not apply with respect to the Sacramento Army Depot, Sacramento, California.

(e) Report. - Not later than January 15, 1995, the Secretary of Defense shall submit to Congress a report identifying, for each military department and Defense Agency, the percentage of funds referred to in subsection (a) that was used during fiscal year 1994 to contract for

the performance by non-Federal Government personnel of depot-level maintenance and repair workload.

-SOURCE-

(Added Pub. L. 100-456, div. A, title III, Sec. 326(a), Sept. 29, 1988, 102 Stat. 1955; amended Pub. L. 101-189, div. A, title III, Sec. 313, Nov. 29, 1989, 103 Stat. 1412; Pub. L. 102-190, div. A, title III, Sec. 314(a)(1), Dec. 5, 1991, 105 Stat. 1336; Pub. L. 102-484, div. A, title III, Sec. 352(a)-(c), Oct. 23, 1992, 106 Stat. 2378; Pub. L. 103-337, div. A, title III, Sec. 332, Oct. 5, 1994, 108 Stat. 2715; Pub. L. 104-106, div. A, title III, Sec. 312(b), Feb. 10, 1996, 110 Stat. 250.)

-STATAMEND-

REPEAL OF SECTION

For contingent effective date of repeal of this section by section 311(f)(1) of Pub. L. 104-106, see section 311(f)(3) of Pub. L. 104-106, set out in a Policy Regarding Performance of Depot-Level Maintenance and Repair for Department of Defense note under section 2464 of this title.

AMENDMENTS

1996 - Subsec. (b). Pub. L. 104-106, Sec. 312(b), redesignated subsec. (b) as section 2472(a) of this title.

1994 - Subsec. (a). Pub. L. 103-337, Sec. 332(a), amended heading and text of subsec. (a) generally. Prior to amendment, text read as follows:

''(1) Except as provided in paragraph (2), the Secretary of a military department and, with respect to a Defense Agency, the Secretary of Defense, may not contract for the performance by non-Federal Government personnel of more than 40 percent of the depot-level maintenance workload for the military department or the Defense Agency.

''(2) The Secretary of the Army shall provide for the performance by employees of the Department of Defense of not less than the following percentages of Army aviation depot-level maintenance workload:

''(A) For fiscal year 1993, 50 percent.

''(B) For fiscal year 1994, 55 percent.

''(C) For fiscal year 1995, 60 percent.''

Subsec. (b). Pub. L. 103-337, Sec. 332(b), inserted ''and repair'' after ''maintenance'' in two places.

Subsec. (e). Pub. L. 103-337, Sec. 332(c), amended heading and text of subsec. (e) generally. Prior to amendment, text read as follows:

''(1) Not later than January 15, 1992, and January 15, 1993, the Secretary of the Army and the Secretary of the Air Force shall jointly submit to Congress a report describing the progress during the preceding fiscal year to achieve and maintain the percentage of depot-level maintenance required to be performed by employees of the Department of Defense pursuant to subsection (a).

''(2) Not later than January 15, 1994, the Secretary of each military department and the Secretary of Defense, with respect to the Defense Agencies, shall jointly submit to Congress a report described in paragraph (1).''

1992 - Subsec. (a). Pub. L. 102-484, Sec. 352(a), amended subsec.

(a) generally. Prior to amendment, subsec. (a) read as follows:

''Percentage Limitation. - Not less than 60 percent of the funds available for each fiscal year for depot-level maintenance of materiel managed for the Department of the Army and the Department of the Air Force shall be used for the performance of such depot-level maintenance by employees of the Department of Defense.''

Subsec. (c). Pub. L. 102-484, Sec. 352(b), substituted ''The Secretary of the military department concerned and, with respect to a Defense Agency, the Secretary of Defense'' for ''The Secretary of the Army, with respect to the Department of the Army, and the Secretary of the Air Force, with respect to the Department of the Air Force,''.

Subsec. (e). Pub. L. 102-484, Sec. 352(c), designated existing provisions as par. (1) and added par. (2).

1991 - Pub. L. 102-190 substituted section catchline for one which read ''Prohibition on certain depot maintenance workload competitions'' and amended text generally. Prior to amendment, text read as follows: ''The Secretary of Defense shall prohibit the Secretary of the

Army and the Secretary of the Air Force, in selecting an entity to perform any depot maintenance workload, from carrying out a competition for such selection -

''(1) between or among maintenance activities of the Department of the Army and the Department of the Air Force; or

''(2) between a maintenance activity of either such department and a private contractor.''

1989 - Pub. L. 101-189, in introductory provisions, substituted

''shall prohibit'' for ''may not require'', ''Army and'' for ''Army or'', and ''from carrying out'' for ''to carry out''.

CONGRESSIONAL FINDINGS

Section 331 of Pub. L. 103-337 provided that: ''Congress makes the following findings:

''(1) By providing the Armed Forces with a critical capacity to respond to the needs of the Armed Forces for depot-level maintenance and repair of weapon systems and

equipment, the depot-level maintenance and repair activities of the Department of Defense play an essential role in maintaining the readiness of the Armed Forces.

''(2) It is appropriate for the capability of the depot-level maintenance and repair activities of the Department of Defense to perform maintenance and repair of weapon systems and equipment to be based on policies that take into consideration the readiness, mobilization, and deployment requirements of the military departments.

''(3) It is appropriate for the management of employees of the depot-level maintenance and repair activities of the Department of Defense to be based on the amount of workload necessary to be performed by such activities to maintain the readiness of the weapon systems and equipment of the military departments and on the funds made available for the performance of such workload.''

REUTILIZATION INITIATIVE FOR DEPOT-LEVEL ACTIVITIES

Section 337 of Pub. L. 103-337 provided that:

''(a) Program Authorized. - The Secretary of Defense shall conduct activities to encourage commercial firms to

enter into partnerships with depot-level activities of the military departments for the purposes of -

''(1) demonstrating commercial uses of the depot-level activities that are related to the principal mission of the depot-level activities;

''(2) preserving employment and skills of employees currently employed by the depot-level activities or providing for the reemployment and retraining of employees who, as the result of the closure, realignment, or reduced in-house workload of such activities, may become unemployed; and

''(3) supporting the goals of other defense conversion, reinvestment, and transition assistance programs while also allowing the depot-level activities to remain in operation to continue to perform their defense readiness mission.

''(b) Conditions. - The Secretary shall ensure that activities conducted under this section -

''(1) do not interfere with the closure or realignment of a depot-level activity of the military departments under a base closure law; and

''(2) do not adversely affect the readiness or primary mission of a participating depot-level activity.''

CONTINUATION OF PERCENTAGE LIMITATIONS ON PERFORMANCE OF DEPOT-LEVEL MAINTENANCE

Pub. L. 103-160, div. A, title III, Sec. 343, Nov. 30, 1993, 107 Stat. 1624, provided that: ''The Secretary of Defense shall ensure that the percentage limitations applicable to the depot-level maintenance workload performed by non-Federal Government personnel set forth in section 2466 of title 10, United States Code, are adhered to.''

EFFECT OF 1992 AMENDMENTS ON EXISTING CONTRACTS

Section 352(d) of Pub. L. 102-484 provided that: ''The Secretary of a military department and the Secretary of Defense, with respect to the Defense Agencies, may not cancel a depot-level maintenance contract in effect on the date of the enactment of this Act (Oct. 23, 1992) in order

to comply with the requirements of section 2466(a) of title 10, United States Code, as amended by subsection (a).''

PROHIBITION ON CANCELLATION OF CONTRACTS IN EFFECT ON DECEMBER 5, 1991

Section 314(a)(3) of Pub. L. 102-190 provided that: ''The Secretary of the Army and the Secretary of the Air Force may not cancel a depot-level maintenance contract in effect on the date of the enactment of this Act (Dec. 5, 1991) in order to comply with the requirements of section 2466(a) of such title, as amended by subsection (a).''

COMPETITION PILOT PROGRAM; REVIEW AND REPORT

Section 314(b)-(d) of Pub. L. 102-190, as amended by Pub. L. 102-484, div. A, title III, Sec. 354, Oct. 23, 1992, 106 Stat. 2379, provided that:

''((b) Repealed. Pub. L. 102-484, div. A, title III, Sec. 354, Oct. 23, 1992, 106 Stat. 2379.)

''(c) Review by Comptroller General. - Not later than February 1, 1994, the Comptroller General shall submit to Congress an evaluation of all depot maintenance workloads of

the Department of Defense, including Navy depot maintenance workloads, that are performed by an entity selected pursuant to competitive procedures.

''(d) Report by Secretary of Defense. - Not later than December 1, 1993, the Secretary of Defense shall submit to Congress a report-

''(1) containing a five-year strategy of the Department of Defense to use competitive procedures for the selection of entities to perform depot maintenance workloads; and

''(2) describing the cost savings anticipated through the use of those procedures.''

PILOT PROGRAM FOR DEPOT MAINTENANCE WORKLOAD COMPETITION

Pub. L. 101-510, div. A, title IX, Sec. 922, Nov. 5, 1990, 104 Stat. 1627, authorized a depot maintenance workload competition pilot program during fiscal year 1991, outlined elements of the program, and provided for a report not later than Mar. 31, 1992, to congressional defense committees, prior to repeal by Pub. L. 102-190, div. A, title III, Sec. 314(b)(2), Dec. 5, 1991, 105 Stat. 1337.

TELEPHONE INTERVIEWS

1. Mr. George Ball, Item Manager for F-14D applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 7 May 1998.
2. Mr. Alan Boyden, Program Manager, Rockwell's Collins Avionics and Communications Division, Cedar Rapids, Iowa, 8 May 1998.
3. Mr. Norman Canter, Item Manager for F-14D applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 7 May 1998.
4. Mrs. Dorothy Corbett, Item Manager for AV-8B applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 5 May 1998.
5. Mrs. Pat Gallagher, Item Manager for EA-6B applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 4 May 1998.
6. Mr. Jim Gillen, Technical Advisor for F-14D applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 4 May 1998.
7. Mrs. Pam Gray, Contract Specialist (Code A-2.5.1.4.2), Naval Air Systems Command, Patuxet River Maryland, 11 May 1998.

8. Mr. Jim Lomano, Assistant Helicopter Weapons System Manager, Naval Inventory Control Point, Philadelphia, Pennsylvania, 17 June 1997.

9. Mrs. Lisa Mahoney, Item Manager for H-46 applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 6 May 1998.

10. Mr. Jim Mockus, Office of the Comptroller, Naval Inventory Control Point, Philadelphia, Pennsylvania, 17 June 1997.

11. Capt. Richard E. Morrison, SC, USN, (Code 3.8), Naval Air Systems Command, Patuxet River, Maryland, 10 June 1997.

12. Mrs. Marlene Rodgers, Value Engineering, Bell Helicopter, Fort Worth, Texas, 21 May 1998.

13. Mr. Claud Messamore, Director of Contracts, Sanders-Lockheed Martin, Nashua, New Hampshire, 22 May 1998.

14. Mrs. Maggie Wilbey, Item Manager for F-14D applications, Naval Inventory Control Point, Philadelphia, Pennsylvania, 12 May 1998.

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7. Commander, Naval Inventory Control Point operations Policy and Procedures Memorandum #231A of 22 Nov 1994.

8. Commander, Naval Inventory Control Point, Philadelphia, Management Information System (ICPNET).

9. Commander, Naval Supply Systems Command message dtg 221430Z May 97 (Subj.: FHP SAVINGS INITIATIVE).

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18. Office of the Inspector General, Limitation on Payments Statements for Fixed Price Incentive-Fee Contracts (Audit Report), 28 July 1988.

19. Report of the Secretary of Defense found at http://www.dtic.mil/execsec/adr98/chap18.html.

20. Terasawa, Katsuaki, and Kang, Unclassified Research Paper, *Quota Based Recruiting System and Bonus Incentive Recruiting Model,* Oct 12, 1996.

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